AMSTRAD CPC 464 USER

95p

May 1985

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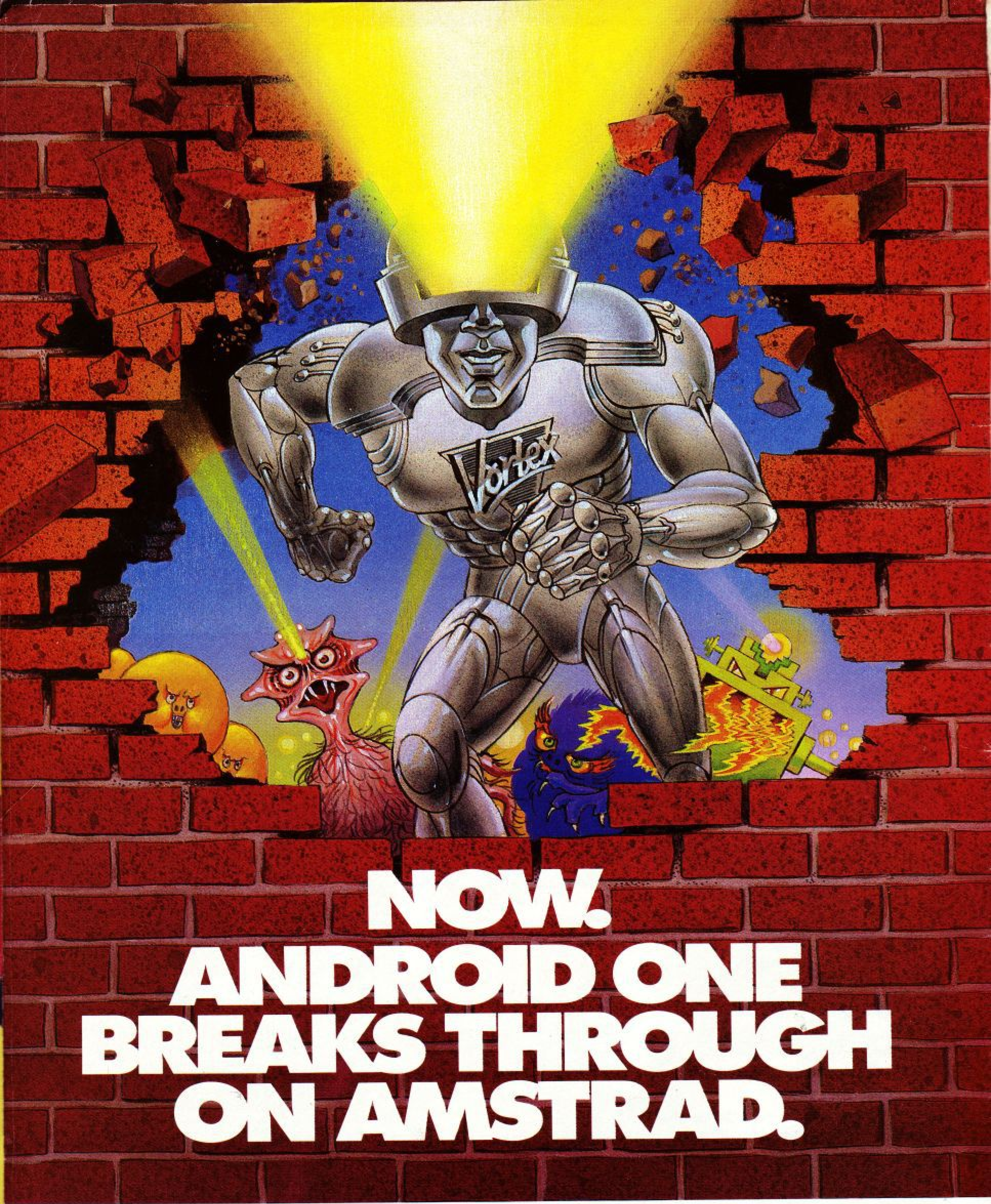
Amstrad User is the OFFICIAL magazine for users of the Amstrad CPC464and CPC664. It is published monthly, the next issue will be on sale from May 11th 1985. Back issues are avaliable from Amsoft Mail Order at £1.20 each (including postage).



Contributions are welcomed from readers and professional journalists. If you want them returned, then please send a large SAE with all submissions. Please note the views and opinions expressed herein are not necessarily those of Amstrad, or Amsoft but represent the views of our many readers, owners, members and contributors.

Managing Editor
William Poel
Editor
Simon Rockman
Production Editor
Ivor Spital
Designer and illustrator
John Alexander
Layout
Des Rackliff
Mike Smith
Computer composition
Mike Dowsett & Miša Konstantinović
Photography
Chris Anstey
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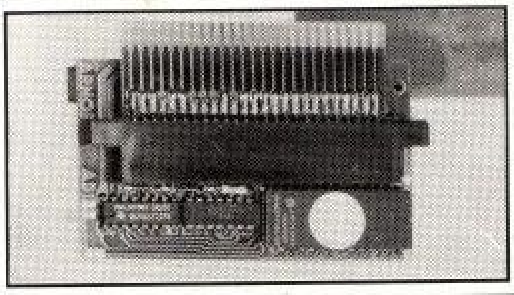
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NEWS

Play the Game

In the world of the Sinclair Spectrum, one name stands out - 'Ultimate'. This is a software house with a reputation and a half. They shy away from publicity and no-one knows who the programmers are. If anyone else tried this, they would die from lack of sales. Ultimate prosper because they produce the most mind-blowing software. Both technically brilliant and fun to play, the graphics are second to none and the programming superb. If all this hyperbole sounds a bit much, wait until you see NIGHTLORE, a 3D graphics adventure. It was a tremendous success on the Spectrum and is bound to be our game of the month for next month. The program will cost £9.95. Amstrad User will carry a full review plus a competition to win a Sinclair C5 electric thingy.



Jet Set Willy arrives

It has been a long time coming, but Jet Set Willy is finally here. After many joystick wrenching games well into the small hours, Amstrad User can report that it was worth waiting for. With 133 rooms it took our most hardened games player nearly a week to find them all, and that was only after he had got the game onto disc and found the infinite lives' poke. Expect as full a map as we can squeeze into our pages next month.

Amstrad find a voice

Amstrad are to launch a speech synthesiser for the CPC464. To be called the SSA-1 the device looks a lot like the disc interface box, and plugs into the disc interface port. The styling of the speakers is a little odd. They are wedge-like and made of the same kind of plastic as the computer's casing. Each speaker carries the Amstrad logo. As with any bit of computer hardware the SSA-1 requires software to make it useful. The software in this case comes in the form of a set of RSXs on cassette. Unlike the disc interface, the SSA-1 has a slot in the back so that other peripherals can be added on. Launched on April 18th the SSA-1 will be available in June. Amstrad user hopes to review this £29.95 peripheral before then.

Arnor put in ROM

The Arnor Maxam assembler is now available in sideways ROM.One of the features of the CPC464 which has been overlooked until now is the ability to add sideways ROMs. These are programs which just plug into the back of the computer on the disc connector (or EXPANSION port on the CPC664). They don't have to be loaded and can be ignored by a BASIC or machine code program. When you want to use the program you simply type ‡MAXAM. If you need to know which ROMs you have attached, you simply type ‡HELP with the Arnor ROM board attached, and it will tell you. With the MAXAM assembler, the unit costs £59.90. Initially this may seem a lot, but when you look at the alternatives it really is very cheap. The documentation is very good and the construction is solid. The device is disc compatible and has a socket to allow further ROMs to be added.

Dodgy dealer

Are you a budding 'Arfer Daley'. If so you should be interested in Minder from DK 'Tronics. This is a simulation with adventure type input and output. There are two graphics windows, one of which shows the faces of the people you meet and have to trade with. Part of the attraction of this program is the interesting items you deal in. All the people you meet have a personality and will react to the way that you treat them. The game is played in real time, the 14 days trading takes less than 1 hour to play.

A booklet of documentation gives hints on bargaining plus keywords. The author, Don Priestley, points out that this is not an adventure although the input is text; it is a game of strategy which CAN be finished. Minder will cost you £9.95 (or about ten nicker)!

Amstrad Computer User

The big news this month is the CPC664 -there is a full review on page 42. Because we want to write about this new machine we considered changing the name of the magazine to 'Amstrad CPC464 and CPC664 User' but decided that the way Amstrad are going, we could soon run out of room on the cover. Instead we have decided to drop the name of the machine and simply become Amstrad Computer User. To avoid any confusion this will start with issue 7 and be available from May 9th.

Regular Frankie Fan

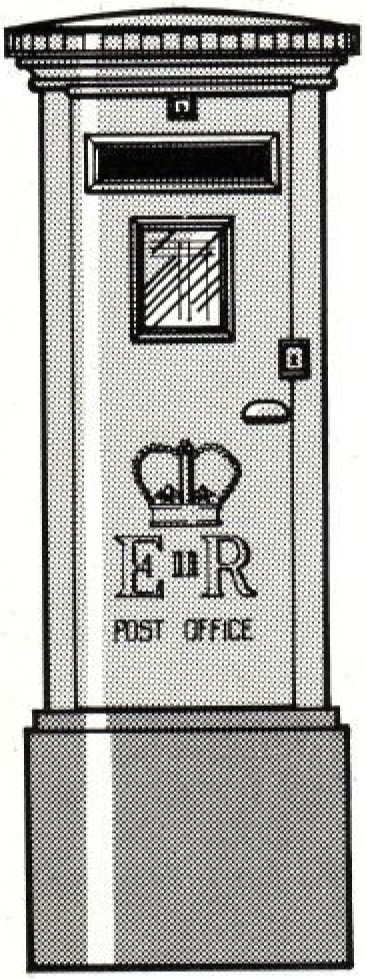
The Amstrad version of 'The Rocky Horror Show' will be launched on May 1st. Although still a long way from completion, Amstrad User got a sneak preview of a demonstration version. Your task is to rescue your partner from the clutches of the dreaded Dr. Frankenfurter. You do this with the aid of the de-Medusa ray which has to be assembled from parts which can be found all over the house. Fans of the cult stage-show will recognize all the usual characters. Perhaps the game



will increase the size of the audiences at the Baker Street cinema, which has run the film every night for years.

USERS' VIEWS

A brief letters section this month -there's just no room left! We promise more next month.



A Case History

Dear Sir,

I'm not usually given to writing to firms about their products, but there's an article in today's Telegraph that has annoyed me.

You've undoubtedly seen it. The heading is that sales of 'Toy' computers have peaked and most of the quotes that matter are from Mintel Publications Market Research.

Though there is some truth in what was said, the statement was far too sweeping and, I think, doesn't specifically apply to Amstrad. It certainly doesn't apply in my case and I think that my 'case history' may interest you.

I started off with a couple of ZX81s -one for me, one for my son, which I bought, (as far as my use was concerned), solely for self training in what a micro could do. I knew that I was going to be equipped with BBC machines at work, (I run a Department of a Technical College), and I also knew I couldn't afford a BBC for myself. I learned a lot, particularly from manipulating Campbell's ZX program called 'The Fast One' from which 'Masterfile' was developed.

Anyway, the BBCs arrived at work - I have twelve in the Department, and I still couldn't afford one at home. I vaguely thought of upgrading to a Spectrum but I couldn't think of anything I wanted to do on the Spectrum that I couldn't already do on the ZX. I wasn't all that happy with the BBC machine either. Wordwise in 40 columns was clumsy, and I haven't yet come across a Data program that rivals Campbell's. Anyway.... at that point the Amstrad came onto the market.

I do a lot of writing one way or another and I'm a fair amateur typist.

I have now given up my conventional typewriter. I never thought I'd be able to use a word processor - now I can!

The point I'm trying to make is that Amstrad seem to miss this use of the 464 in their advertising. It's the cheapest word processing package on the market. Real one, anyway.

Disc drives are an unnecessary luxury unless, and until, you can merge Tasword and Masterfile with a search routine on the disc.

Commodore can't compare, nor can the BBC machine. The 464 is very far from being a 'toy' and any serious home typist ought to be made aware of what the 464 can do.

Sorry to be overwhelmed with such enthusiasm. Amstrad probably know all this anyway; but if they do, they don't seem to want to tell anybody. I found out by accident.

By the way. I hope Amstrad don't burn their fingers in the States like other English companies. Ignore them. Just pick up the U.S. market in the rest of the world......the drop in the pound has some advantages.

E. C. Hill,
Essex.

Typo's

Dear Sir,

I wish to draw your attention to the program listings that you print in your magazine. I know that you cannot guarantee the listings as correct, and that there will always be some mistakes, but as I have only had the Arnold for a few months, I cannot yet be called a brilliant programmer. Unfortunately then, when mistakes are made, unless it is simple, I find myself not being able to sort things out.

I would like to suggest that you employ one of your staff in sitting at the Arnold and typing in the listings as published, then any mistakes found could be printed in the next month's edition. This would help me, and I think many other people.

S. Lambourn,
Swindon.

Amstrad User: You will find some corrections elsewhere in this issue, and yes, we are very ashamed of the errors. However, the task of producing the 'newsletter' has grown somewhat from the initial brief and the volume of work is overwhelming. The problem lies in the fact that we cannot get a complete typeface for the OCRB system that contains all the ASCII characters, and so have to fix things like exponentiation symbols by hand. The characters that foul up therefore tend to be:

↑,£,/,#,_,@,|,\

If you get an unknown error in a line, then it will almost certainly be one of the above characters missing. We're working on developing the software for processing listings all the time, and hope (and pray) that we have nearly perfected it by now!

SOFTWARE FOR THE CLOCK-DIARY

As explained last issue, the real time clock and diary are controlled by the Z80APIO chip and this, in turn, is driven by &141 bytes of machine code. BASIC can communicate with six machine code routines. These are:

PIOINI Set PIO
LCLOCK Set clock
RCLOCK Read clock
W6116 Write to diary
R6116 Read diary
SETCOU Set diary addr

There are a few other sub-routines in the listings, and the most important (from the program's point of view) are the three that directly control the PIO. These are:

AREAD 'A lines' are reading
AWRITE 'A lines' are writing
BWRITE 'B lines' are writing

The code is presented with the start address of &9270 (37488) and the six routines that can be run from BASIC have been assigned relative addresses rather than absolute addresses. Thus CALLing LCLOCK from BASIC is accomplished by a CALL to &9270+&57. By doing things this way it is possible to relocate the machine code and run it at the new address without resorting to the use of an assembler.

The source code listing has been produced using the Hisoft Devpac assembler and if you have this utility, re-assembly at an address of your choice will pose no problems. If you haven't an assembler then do try to load the code at &9270 and adjust MEMORY as appropriate. The relocator, written in BASIC, will take a while to type in, so only use it if you have to!

Loading the machine code

If you have an assembler you needn't read the next few sentences since your manual will give you all the instruction necessary! In BASIC, use the simple hex-loaders published in Amstrad User) and enter all &141 bytes of hex, starting from the load address (the ORG) of your choice. If you have loaded from &9270, then SAVE the bytes using.

```
SAVE "RTC",B,&9270,&141,&92BE
```

If you have loaded from a different address, then replace the &9270 with the ORG that you did use, and replace the &92BE with the value made up from ORG+&4E. Don't forget to use the MEMORY command to protect your code from being corrupted by BASIC programs.

Software

The accompanying listings and data tables will allow simple experimentation with the timer IC. Control words sent to ports 3 or 4 set the data ports in a number of different ways:

Word(s) sent	Effect
0F	8-bit latched output
4F	8-bit input
8F	8-bit bidirectional
CFxx	Individual input or output

xx is formed by using ones for input and zeros for output e.g:

```
7 6 5 4 3 2 1 0
1 1 1 1 0 0 0 0 = F0
```

The high nibble reads while the low nibble writes.

The code is placed at &9270 and is &139 bytes long - a reasonable length of code when you consider that it gives access to an extra 2K of RAM! Remember that HIMEM is lowered to &93AE after the using the cassette system and that the use of the MEMORY command to change HIMEM should only take place when a cassette buffer has been established.

If you decide to use port addresses other than those given, you will need to alter the six occurrences of 'LD BC,xxxx'. The six double-bytes are to be found at the following locations:

&9293	PACON
&929A	PADATA
&92A2	PACON
&92A9	PADATA
&92B1	PBCON
&92B8	PBDATA

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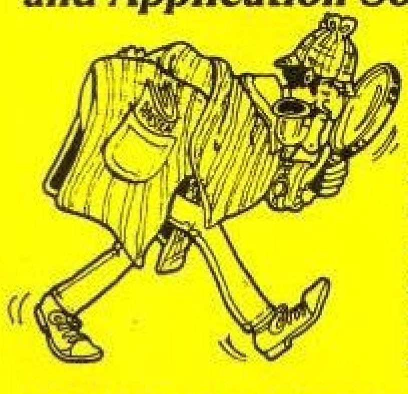


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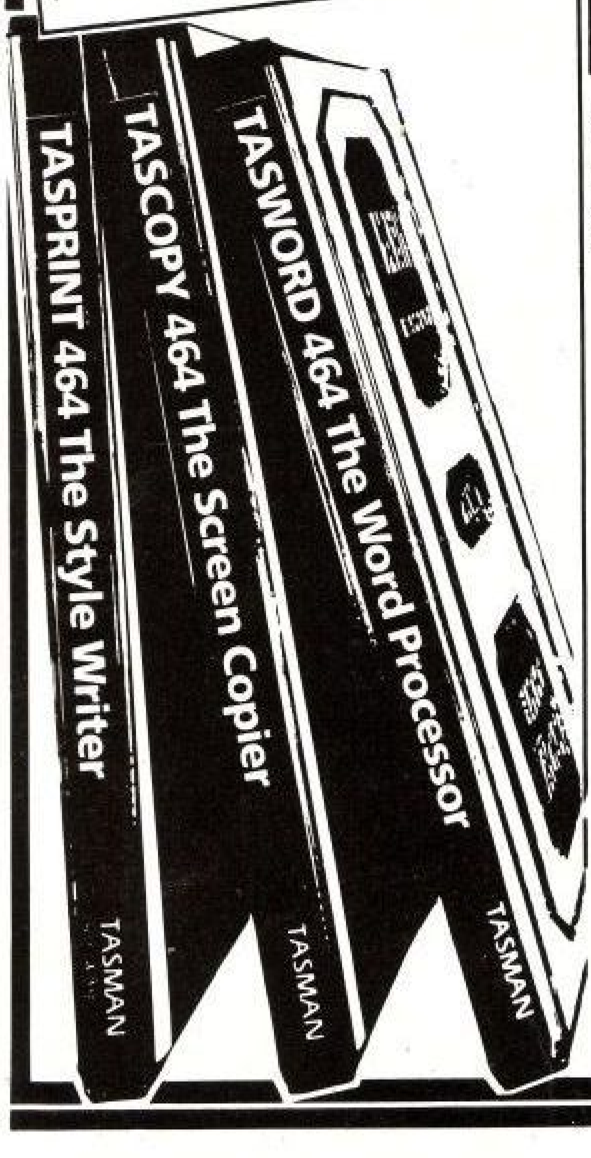
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....and the new port address should be entered low-byte first, as is the Z80 convention.

The BASIC routines that handle the machine code are straightforward and use small areas of RAM at &9270 to pass values to and from the machine code. They are written with a view to clarity rather than elegance, and can be incorporated into your own programs in a suitable amended form. How you deal with the 2000 or so bytes in the 6116 RAM will rather depend on how you are using that chip: as a diary store for characters, or as a back-up store for bytes of data.

Conclusion

Access to the clock and diary is simply a matter of incorporating a few lines of BASIC into your program. Catering for relocated code has clouded the issue slightly (lines 500-520 for example), but essentially there are just the four ways of communicating with the machine. RUN 540, RUN 575, RUN 615 and RUN 645 represent some methods but they are no more than demonstrations. You'll probably want to write your own BASIC to service the machine code in ways best suited to your needs, so good luck.

```
500 REM BASIC FOR REAL-TIME-CLOCK
505 PRINT "RE-AFFIRM THE LOAD ADDRESS USED"
510 INPUT A:PRINT A
515 W1=A:R1=A+&F:START=A+&1E:BYTE=A+&20:PIOINI=A+&4E:LCLOCK=A+&57
520 RCLOCK=A+&84:W6=A+&C6:R6=A+&F4:SETCOU=A+&118
525 :
530 :
535 REM LOAD CLOCK REGISTERS
540 FOR N=1 TO 15
545 PRINT "REG ";N:INPUT V
550 POKE (W1-1+N),V:NEXT N
555 CALL LCLOCK:STOP
560 :
565 :
570 REM READ CLOCK REGISTERS
575 DIM T(15):CALL RCLOCK
580 FOR N=1 TO 15
585  T(N)=PEEK(R1-1+N)
590 NEXT N
595 PRINT "THE TIME IS ";T(6);T(7);":";T(4);T(5):STOP
600 :
605 :
610 REM WRITE A CHARACTER TO DIARY (DEMONSTRATION)
615 GOSUB 695
620 INPUT "SINGLE CHARACTER ";B$:IF LEN(B$)>1 THEN STOP
625 POKE BYTE,ASC(B$):CALL W6:GOTO 620
630 :
635 :
640 REM READ A CHARACTER FROM THE DIARY (DEMONSTRATION)
645  C$="":GOSUB 695
650 INPUT "NUMBER OF CHARACTERS TO READ ";N
655 IF N>255 THEN GOTO 650
660 FOR X=1 TO N
665 CALL R6: A$=CHR$(PEEK(BYTE)): C$=C$+A$
670 NEXT X
675 STOP
680 :
685 :
690 REM SELECT ADDRESS INSIDE 6116
695 INPUT "6116 START ADDRESS ";A
700  H=INT(A/256):POKE (START+1),H:POKE START,A-(H*256)
705 CALL SETCOU:RETURN
```

```
100 REM SIMPLE CODE LOADER
110 REM ENTER ONE BYTE AT A TIME
120 INPUT "STARTING ADDRESS";A
130 LENG=&141
140 ORG=37488
150 FOR N=A TO A+LENG
160 INPUT V$:POKE N,VAL("&"+V$)
170 NEXT N
180 IF A=37488 THEN PRINT "NO RELOCATION NEEDED":STOP
190 :
200 REM RELOCATOR
210 PRINT "SOME BYTES OF CODE WILL NOW BE ADJUSTED TO ";
220 IF A>ORG THEN  OFF=A-ORG: FL=0:PRINT "HIGHER VALUES":GOTO 250
230  OFF=65536-(ORG-A): FL=65536:PRINT "LOWER VALUES"
240 REM NOW MAKE THE CHANGES
250 REM
260 REM FIRST CHANGE ALL SIX POINTERS
270 FOR N=1 TO 6
280 READ P: AD=A+P:GOSUB 410:NEXT N
290 REM NOW CHANGE ALL CALLS
300 REM THERE ARE 4 CALLED ROUTINES, SO:
310 FOR N=1 TO 4
320 READ P: X=A+P
330  LB=PEEK(X): HB=PEEK(X+1): AD=A-1
340 REM SEARCH FOR THEM
350  AD=AD+1:IF AD>(A+LENG) THEN GOTO 380
360 IF PEEK(AD)=&CD AND PEEK(AD+1)=LB AND PEEK(AD+2)=HB THEN GOSUB 410: AD=AD+2
370 GOTO 350
380 NEXT N
390 PRINT "RELOCATION COMPLETE"
400 STOP
410  OLDVAL=PEEK(AD+1)+(PEEK(AD+2)*256)
420  NEWVAL=OLDVAL+OFF-FL: HB=INT(NEWVAL/256)
430 POKE AD+2,HB:POKE AD+1,NEWVAL-(HB*256):RETURN
440 DATA &61,&8C,&9F,&CE,&FC,&120
450 DATA &139,&138,&13D,&13F
```

Assembler listing.

```
Hisoft GENA3.1 Assembler. Page     1.
Pass 1 errors: 00
                  10 ;AMSTRAD R-T-C & DIARY
9270              20          ORG   #9270
FBE7              30 PADATA:  EQU   #FBE7
FBEF              40 PBDATA:  EQU   #FBEF
FBF7              50 PACON:   EQU   #FBF7
FBFF              60 PBCON:   EQU   #FBFF
                  70 ;
9270  00000000    80 W1:      DEFB 0,0,0,0,0,0,0
9277  00000000    90          DEFB 0,0,0,0,0,0,0
927E  00         100 W15:     DEFB 0
927F  00000000   110 R1:      DEFB 0,0,0,0,0,0,0
9286  00000000   120          DEFB 0,0,0,0,0,0,0
928D  00         130 R15:     DEFB 0
928E  0000       140 START:   DEFW 0
                 141
9290  00         150 BYTE:    DEFB 0
                 151
                 160 ;
9291  C5         170 AREAD:   PUSH BC
9292  01F7FB     180          LD   BC,PACON
9295  3E4F       190          LD   A,#4F
9297  ED79       200          OUT  (C),A
                 210 ;PIO NOW SET TO READ
9299  01E7FB     220          LD   BC,PADATA
929C  ED78       230          IN   A,(C)
929E  C1         240          POP  BC
929F  C9         250          RET
                 260 ;WITH VALUE IN REG A
                 270 ;
                 280 ;
                 290 ;ENTER WITH VALUE IN D
92A0  C5         300 AWRITE:  PUSH BC
92A1  01F7FB     310          LD   BC,PACON
92A4  3E0F       320          LD   A,#0F
                 321
92A6  ED79       330          OUT  (C),A
                 340 ;PIO NOW SET TO WRITE
92A8  01E7FB     350          LD   BC,PADATA
92AB  ED51       360          OUT  (C),D
92AD  C1         370          POP  BC
92AE  C9         380          RET
                 390 ;
                 400 ;ENTER WITH VALUE IN E
92AF  C5         410 BWRITE:  PUSH BC
92B0  01FFFB     420          LD   BC,PBCON
92B3  3E0F       430          LD   A,#0F
92B5  ED79       440          OUT  (C),A
92B7  01EFFB     450          LD   BC,PBDATA
92BA  ED59       460          OUT  (C),E
92BC  C1         470          POP  BC
92BD  C9         480          RET
                 490 ;
                 500 ;M/C SUBROUTINE FOR BASIC
92BE  CD9192     510 PIOINI:  CALL AREAD
92C1  1EFF       520          LD   E,#FF
92C3  CDAF92     530          CALL BWRITE
Hisoft GENA3.1 Assembler. Page     2.
92C6  C9         540          RET
                 550 ;
                 560 ;M/C SUBROUTINE FOR BASIC
                 570 ;LOAD R-T-C WITH 15 VALUES
                 580 ;FOUND IN W1 TO W15
                 590 ;
92C7  1EFF       600 LCLOCK:  LD   E,#FF
92C9  CDAF92     610          CALL BWRITE
92CC  CDA092     620          CALL AWRITE
92CF  060F       630          LD   B,15                  ;COUNTER
92D1  217E92     640          LD   HL,W15                ;POINTER
92D4  1EBF       650          LD   E,%10111111           ;B6 LOW FOR CS
92D6  56         660 L1:      LD   D,(HL)                ;GET VALUE
92D7  CDA092     670          CALL AWRITE               ;PRESENT IT TO R-T-C
92DA  CDAF92     680          CALL BWRITE               ;USING E TO SET R-T--
C REGISTER
                 690 ;NOW THE WRITE PULSE
92DD  CBA3       700          RES  4,E
92DF  CDAF92     710          CALL BWRITE
92E2  CBE3       720          SET  4,E
92E4  CDAF92     730          CALL BWRITE
```

AMSTRAD–DRAGON–SPECTRUM–ORIC-1

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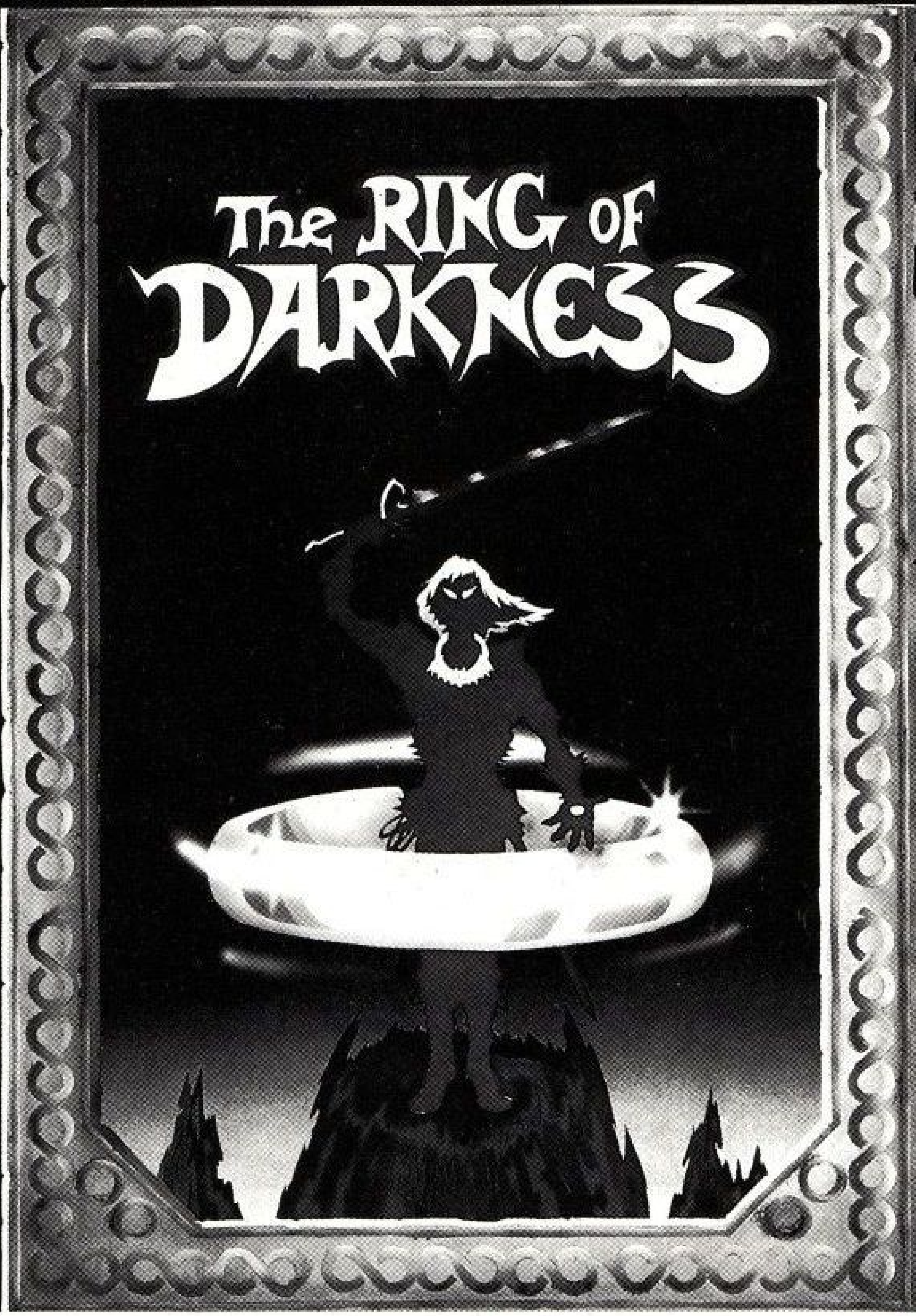
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```
92E7  1D        740          DEC  E                  ;STEP DOWN TO NEXT REG-
ISTER
92E8  2B        750          DEC  HL                 ;AND NEXT VALUE
92E9  10EB      760          DJNZ L1
                770 ;SWITCH OFF
92EB  1EFF      780          LD   E,#FF
92ED  CDAF92    790          CALL BWRITE
92F0  CD9192    800          CALL AREAD
92F3  C9        810          RET
                820 ;
                830 ;M/C SUBROUTINE TO BE USED BY BASIC
                840 ;
                850 ;LOAD R1 TO R15 WITH VALUES FOUND
                860 ;IN R-T-C REGISTERS
                870 ;
92F4  1EFF      880 RCLOCK: LD   E,#FF
92F6  CDAF92    890          CALL BWRITE
92F9  CD9192    900          CALL AREAD
92FC  218D92    910          LD   HL,R15
92FF  1EB1      920          LD   E,%10110001
                930 ;LOOKING AT REG 1
                940 ;NOW WAIT FOR IT TO CHANGE
9301  CD2193    950 L2:      CALL READIT
9304  E60F      960          AND  %00001111
9306  FE0F      970          CP   %00001111
9308  20F7      980          JR   NZ,L2
930A  CD2193    990          CALL READIT
930D  060F      1000         LD   B,15               ;COUNTER
930F  218D92    1010         LD   HL,R15             ;POINTER
9312  1EBF      1020         LD   E,%10111111        ;         B6 LOW FOR CS
9314  CD2193    1030 L3:     CALL READIT
9317  1D        1040         DEC  E                  ;STEP DOWN TO NEXT REG-
ISTER
9318  2B        1050         DEC  HL                 ;AND NEXT VALUE
9319  10F9      1060         DJNZ L3
                1070 ;SWITCH OFF
931B  1EFF      1080         LD   E,#FF
931D  CDAF92    1090         CALL BWRITE
9320  C9        1100         RET
                1110 ;Hisoft GENA3.1 Assembler. Page     3.

9321  CDAF92    1120 READIT: CALL BWRITE
                1130 ;CORRECT REGISTER SET
                1140 ;SO ISSUE READ PULSE
9324  CBAB      1150         RES  5,E
9326  CDAF92    1160         CALL BWRITE
                1170 ;PERFORM THE READ
9329  CD9192    1180         CALL AREAD
                1190 ;WIPE AWAY B7-B4
932C  E60F      1200         AND  %00001111
                1210 ;STORE RESULT
932E  77        1220         LD   (HL),A
                1230 ;END THE READ PULSE
932F  CBEB      1240         SET  5,E
9331  CDAF92    1250         CALL BWRITE
9334  7E        1260         LD   A,(HL)
9335  C9        1270         RET
                1280 ;
                1290 ;
                1300 ;M/C SUBROUTINE FOR USE BY BASIC
                1310 ;WRITE ONE BYTE TO 6116
                1320 ;AUTO INCREMENT ADDRESS
                1330 ;
9336  1EFB      1340 W6116:  LD   E,#FB
9338  CDAF92    1350         CALL BWRITE
933B  CDA092    1360         CALL AWRITE
933E  219092    1370         LD   HL,BYTE            ;POINT TO BYTE
9341  1E7B      1380         LD   E,%01111011        ;B7 LOW FOR CS
9343  CDAF92    1390         CALL BWRITE
9346  56        1400         LD   D,(HL)
9347  CDA092    1410         CALL AWRITE
                1420 ;THE BYTE IS PRESENTED TO THE 6116
934A  1E73      1430         LD   E,%01110011        ;         B3 LOW TO WRITE
934C  CDAF92    1440         CALL BWRITE
934F  1E7B      1450         LD   E,%01111011        ;CANCEL THE WRITE
9351  CDAF92    1460         CALL BWRITE
9354  1EFB      1470         LD   E,%11111011        ;DESELECT 6116
9356  CDAF92    1480         CALL BWRITE
                1490 ;NOW THE AUTO INCREMENT
9359  CB83      1500         RES  0,E
935B  CDAF92    1510         CALL BWRITE
935E  CBC3      1520         SET  0,E
9360  CDAF92    1530         CALL BWRITE
9363  C9        1540         RET
                1550 ;
                1560 ;
                1570 ;M/C SUBROUTINE FOR USE BY BASIC
                1580 ;READ ONE BYTE FROM 6116 AND
                1590 ;AUTO INCREMENT
                1600 ;
9364  1EFB      1610 R6116:  LD   E,#FB
9366  CDAF92    1620         CALL BWRITE
9369  CD9192    1630         CALL AREAD
936C  219092    1640         LD   HL,BYTE            ;POINT AT BYTE
936F  1E7B      1650         LD   E,%01111011        ;         B7 LOW FOR CS
9371  CDAF92    1660         CALL BWRITE
9374  CD9192    1670         CALL AREAD
9377  77        1680         LD   (HL),A
9378  1EFB      1690         LD   E,%11111011        ;DESELECT 6116
Hisoft GENA3.1 Assembler. Page     4.

937A  CDAF92    1700         CALL BWRITE
937D  CB83      1710         RES  0,E
937F  CDAF92    1720         CALL BWRITE
9382  CBC3      1730         SET  0,E
9384  CDAF92    1740         CALL BWRITE
9387  C9        1750         RET
                1760 ;
                1770 ;
                1780 ;M/C SUBROUTINE FOR USE BY BASIC
                1790 ;SET THE 6116 ADDRESS COUNTER
9388  1EFF      1800 SETCOU: LD   E,£FF
938A  CDAF92    1810         CALL BWRITE
938D  CD9192    1820         CALL AREAD
9390  2A8E92    1830         LD   HL,(START)
9393  23        1840         INC  HL
9394  1EFB      1850         LD   E,%11111011        ;ENABLE CMOS COUNTER
9396  CDAF92    1860         CALL BWRITE
9399  2B        1870 L4:     DEC  HL
939A  7C        1880         LD   A,H
939B  B5        1890         OR   L
939C  C8        1900         RET  Z
                1910 ;INCREMENT CMOS COUNTER
                1920 ;BY HARDWARE PULSE
939D  CB83      1930         RES  0,E
939F  CDAF92    1940         CALL BWRITE
93A2  CBC3      1950         SET  0,E
93A4  CDAF92    1960         CALL BWRITE
93A7  18F0      1970         JR   L4
                1980 ;
                1990 ;
93A9  9192      2000 SUB1:   DEFW AREAD
93AB  A092      2010 SUB2:   DEFW AWRITE
93AD  AF92      2020 SUB3:   DEFW BWRITE
93AF  2193      2030 SUB4:   DEFW READIT
                2040 ;
93B1            2050 FIN:    EQU  $
0141            2060 LEN:    EQU  FIN-W1
                2070 ;

Pass 2 errors: 00
Table used:   351  from  1000
```

```
100 REM SIMPLE CODE LOADER
110 REM ENTER ONE BYTE AT A TIME
120 INPUT "STARTING ADDRESS";A
130 LET LENG=&141
140 LET ORG=37488
150 FOR N=A TO A+LENG
160 INPUT V$:POKE N,VAL("&"+V$)
170 NEXT N
180 IF A=37488 THEN PRINT "NO RELOCATION
 NEEDED":STOP
190 :
200 REM RELOCATOR
210 PRINT "SOME BYTES OF CODE WILL NOW B
E ADJUSTED TO ";
220 IF A>ORG THEN LET OFF=A-ORG:LET FL=0
:PRINT "HIGHER VALUES":GOTO 250
230 LET OFF=65536-(ORG-A):LET FL=65536:P
RINT "LOWER VALUES"
240 REM NOW MAKE THE CHANGES
250 REM
260 REM FIRST CHANGE ALL SIX POINTERS
270 FOR N=1 TO 6
280 READ P:LET AD=A+P:GOSUB 410:NEXT N
290 REM NOW CHANGE ALL CALLS
300 REM THERE ARE 4 CALLED ROUTINES, SO:
310 FOR N=1 TO 4
320 READ P:LET X=A+P
330 LET LB=PEEK(X):LET HB=PEEK(X+1):LET
AD=A-1
340 REM SEARCH FOR THEM
350 LET AD=AD+1:IF AD>(A+LENG) THEN GOTO
 380
360 IF PEEK(AD)=&CD AND PEEK(AD+1)=LB AN
D PEEK(AD+2)=HB THEN GOSUB 410:LET A
D=AD+2
370 GOTO 350
380 NEXT N
390 PRINT "RELOCATION COMPLETE"
400 STOP
410 LET OLDVAL=PEEK(AD+1)+(PEEK(AD+2)*25
6)
420 LET NEWVAL=OLDVAL+OFF-FL:LET HB=INT(
NEWVAL/256)
430 POKE AD+2,HB:POKE AD+1,NEWVAL-(HB*25
6):RETURN
440 DATA &61,&8C,&9F,&CE,&FC,&120
450 DATA &139,&13B,&13D,&13F)
430 POKE AD+2,HB:POKE AD+1,NEWVAL-(HB*25
6):RETURN
440 DATA &61,&8C,&9F
```

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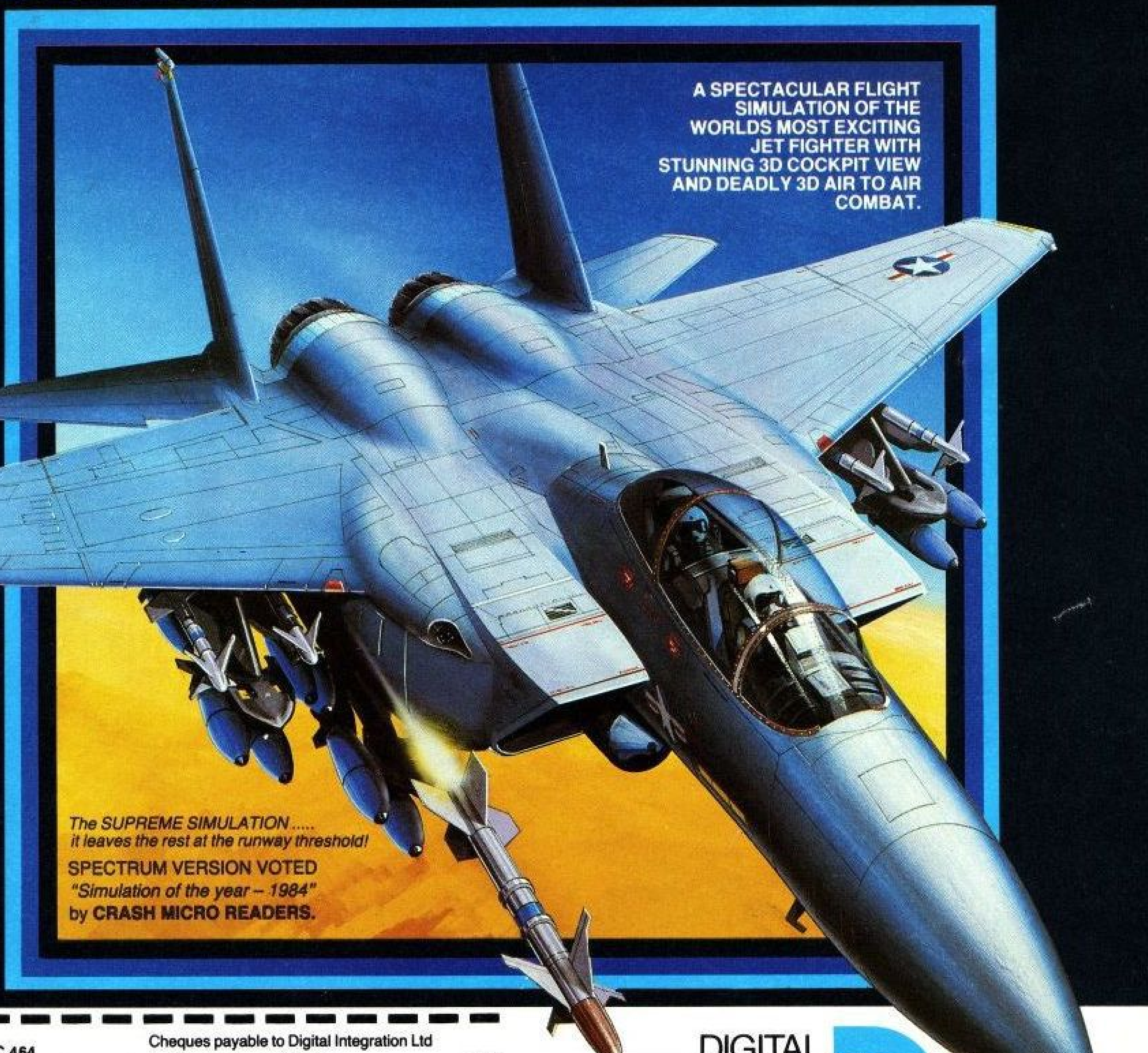
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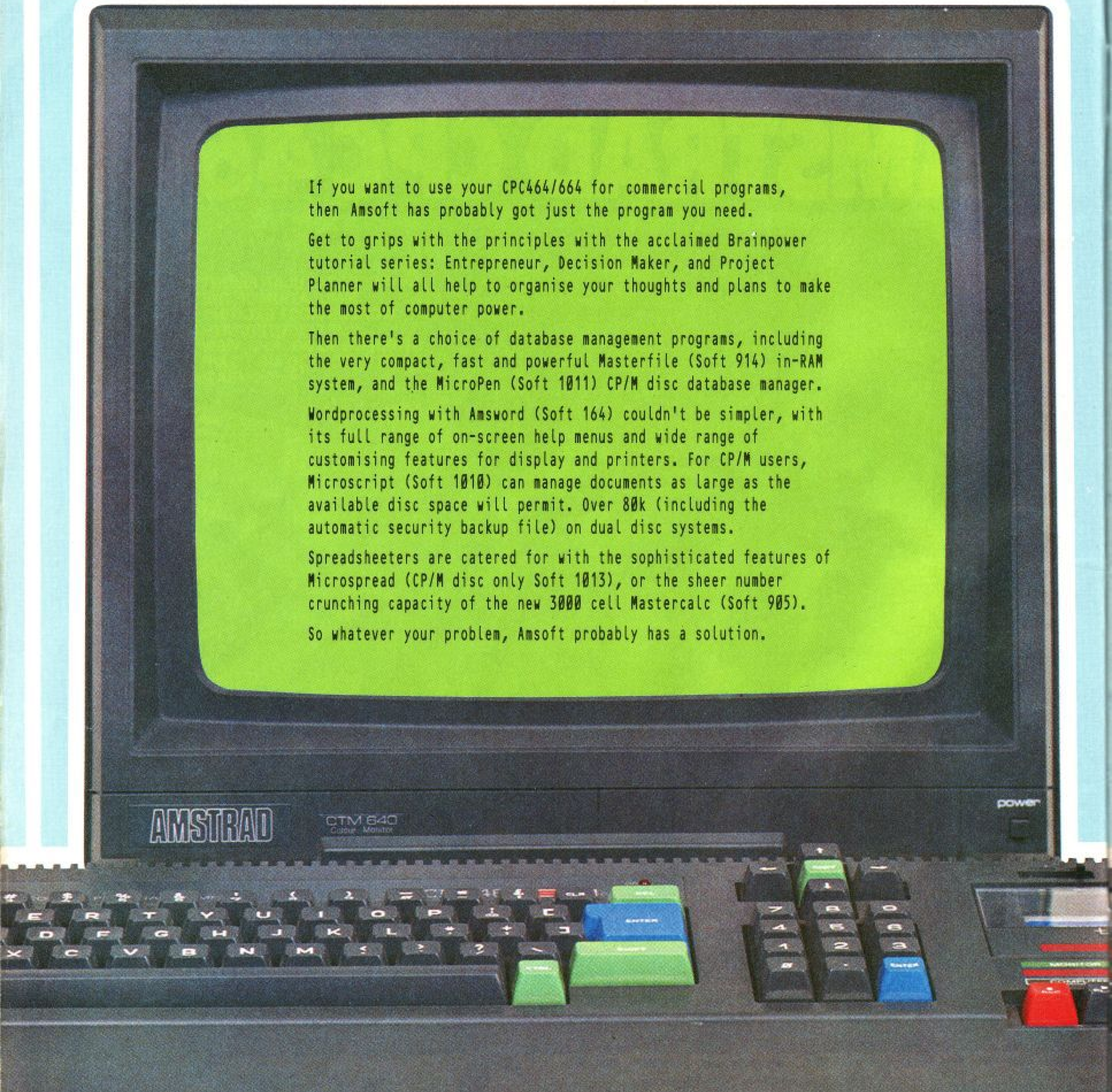
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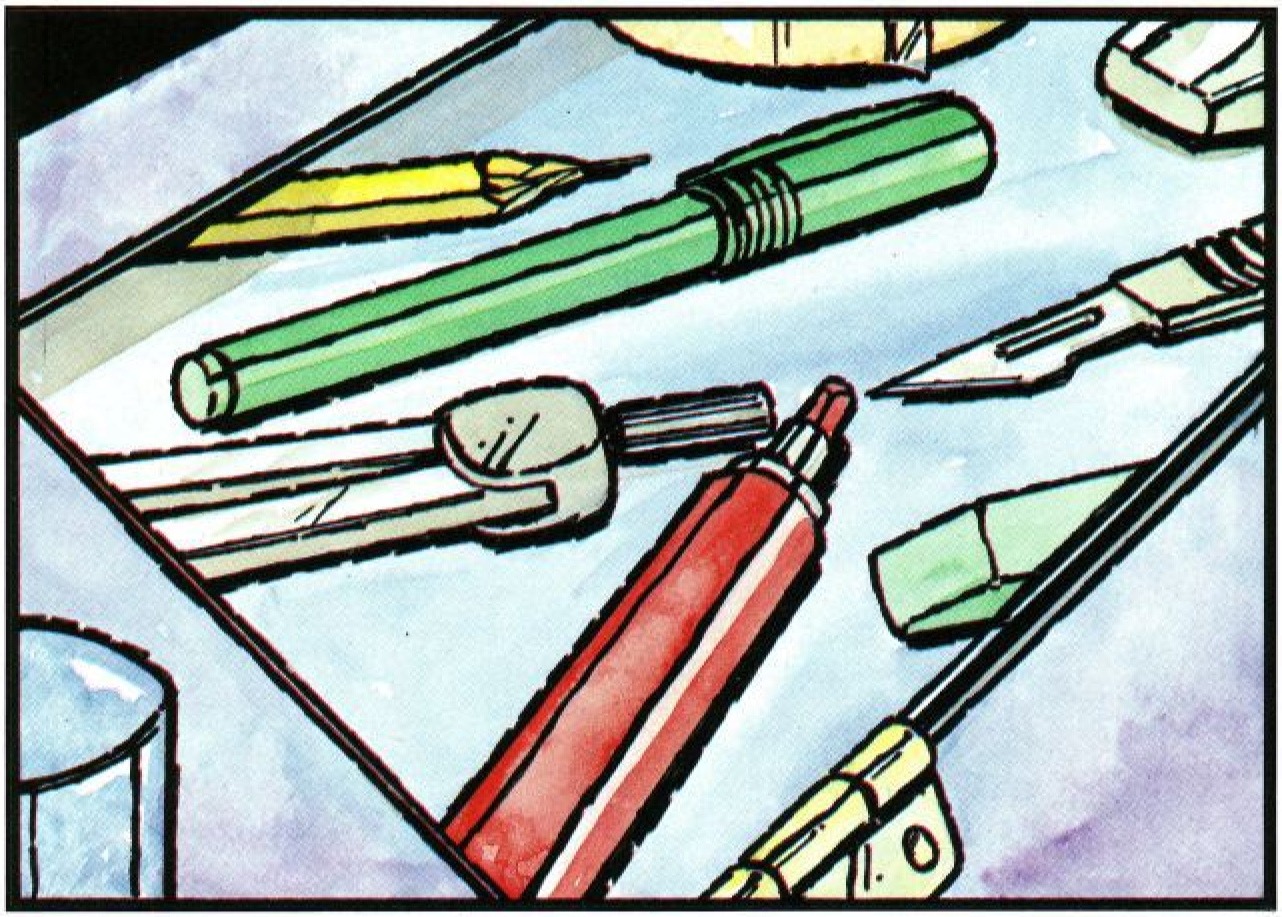
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GRAPHICS TOOLBOX



Like most programmers, I have a collection of graphics routines which I use regularly; some essential and functional, others which just add a nice finishing touch. In order to reduce the amount of typing in of program code I use a LIBRARY of routines which can be merged into any program and called when required. Over the next few issues I will include all of these 'GRAPHICS TOOLBOX' routines in the column, but first, to make them easy to use , we need to do a bit of organising so that our programs do not clash.

Firstly we need to establish a pattern of line numbers which will allow the TOOLBOX routines to be used yet always leave room for your own special enhancements. So from now on, all of my graphics programs will be organised thus:

LINES 1 to 9999	MAIN PROGRAM
LINES 10000 to 19999	SPECIAL USER ROUTINES
LINES 20000 to 29999	TOOLBOX ROUTINES

Next, so that individual routines can be stored and easily located on tape, we need to organise the TOOLBOX so that the line numbers used fall into a sensible sequence. Here is the sequence of the first six routines:

START LINE	ROUTINE NAME	PURPOSE
20000	PLOTEND	Controls action after plotting is done.
20200	DRAWBOX	Draws a rectangle of any size.
20400	YESNO	Gets a yes or no answer from user. Starts program
20600	FREND	with a tidy FRONT END.
20800	SDUMP	Screen dump to AMSTRAD DMP1 printer.
21100	ESDUMP	Screen dump to EPSON type printer.



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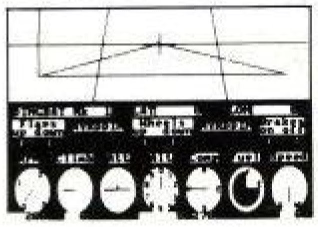
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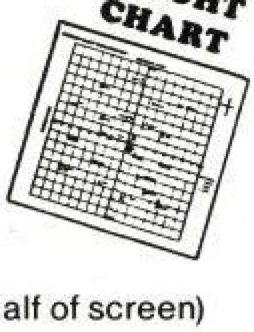


MANUAL

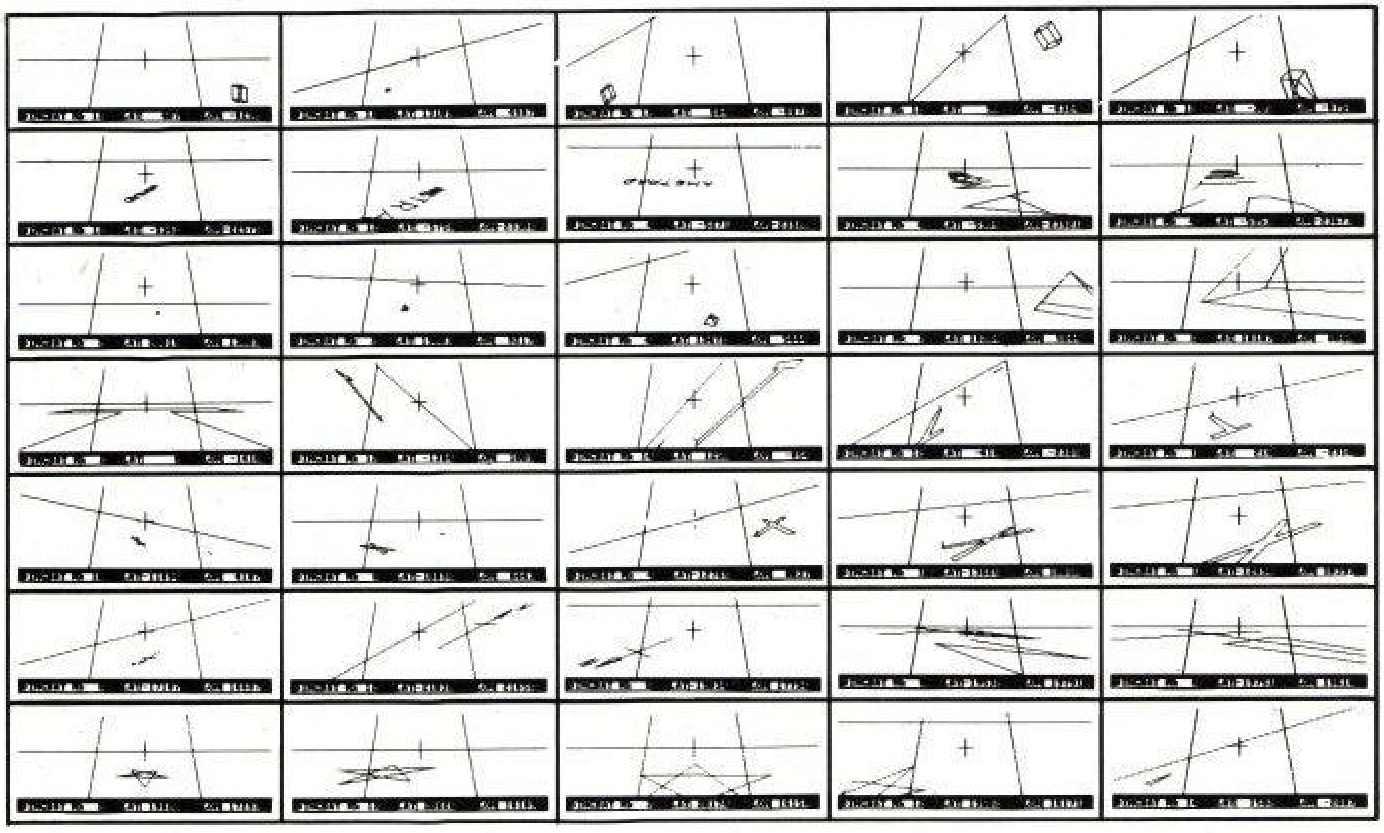


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With the exception of SDUMP (published in Issue 2) the other routines are listed below in Listings 1 to 5. Would anyone using SDUMP please renumber the routine using the command RENUM 20800,10 then resave it to tape as an ASCII file by typing SAVE"SDUMP",A . It is important to save your TOOLBOX routines as ASCII files so that they can be merged into later programs; a routine saved without the ,A option will not merge at all.

Try out your new TOOLBOX routines on this month's little program, which will be the last of the 'draw a pattern' variety for a while. It simulates one of those Spirograph drawing toys which comprised a number of toothed wheels which guide a pen over the paper in a regular spiralling pattern. The PEN OFFSET entry represents the distance between the centre of the secondary circle and the pen.

The CPC464 has all the necessary primitive routines accessible from BASIC but lacks the instructions necessary for the processing of shapes. There is only so much that can be crammed into 16K of BASIC ROM and routines like CIRCLE were left out whilst unique instructions like AFTER and EVERY were included. However this is easy to overcome and this months collection of routines run at an acceptable speed - even though they are written in interpreted BASIC. Here are the TOOLBOX library extensions -

START LINE.	ROUTINE NAME.	PURPOSE.
21500	DOTLINE	Draws a dotted line between two points with user control over the spacing between the dots.
21700	PAINT	Fills a pre-drawn shape with points of the current pen colour. Complex shapes can be filled from a start point, inside the shape, provided by the user.
21900	TRIANGLE	Draws a triangle of user defined base and height.
22000	CIRCLE	Draws a circle of user defined radius with the interval between plotted points also controllable.
22100	ELLIPSE	Draws an ellipse of user defined radius (along the x axis). In addition, the percentage of the total arc to be drawn can be controlled.

Each subroutine is given as a listing preceded by one or more lines wwich demonstrate the routine in action. You should SAVE each routine as a separate file using the ,A option so that they can be MERGED with your own programs as necessary. e.g. `SAVE "DOTLINE",A`

DOTLINE

ENTRY CONDITIONS: You must specify the start and end points of the line using the integer variables XS% YS% x & y co-ordinates of start point. XF% YF% x & y co-ordinates of end point DS must also be specified to set the DOT SPACING : the minimum value of DS should not be set below 1 as this would only produce a solid line plotted more slowly than necessary.

PAINT

ENTRY CONDITIONS: You need to set only three variables before calling this routine. XS% and YS% set the start point where the area fill will begin - this point should lie inside the shape which you want painted. The integer variable MI% (mode indicator) should be set to 2 if you are plotting in MODE 1 and set to 1 if plotting in MODE 2. If you get this the wrong way round, the paint will leak through the walls in MODE 2.

The two arrays XP% and YP% are set to a size of 200 elements each but if you need to fill large areas of screen the array size may need to be increased. PAINT is capable of handling complex shapes and it is intended that this should be the main function of this routine. If large rectangular areas need to be coloured there are much faster, brute force, methods using DRAW which are better suited to that task. (see next month's issue if you haven't already written a routine of your own.)

TRIANGLE

ENTRY CONDITIONS: Integer variables X0% and Y0% are set to values which will mark the CENTRE point of the triangle. BASE and HI should be set to the PIXEL values of the base and height.

CIRCLE

ENTRY CONDITIONS: XS% and YS% are used to set the centre point of the circle and R% used to fix the radius in pixels. The interval between the dots is controlled through the variable DS.

ELIPSE

ENTRY CONDITIONS: This routine uses the same entry variables as CIRCLE and also has two additional control variables which should be set. FF (Flatness Factor) controls the degree of flatness - the smaller the value the flatter will be the shape - 1 will give a pure circle, 0.2 will produce a 'sausage'. AR controls the arc which is drawn, so a value of 1 will draw a full 360 degrees whereas 0.5 would draw only 180 degrees.

Each routine can be used without regard for whether all of the shape to be drawn will fit onto the screen, and those sections which do remain are properly 'clipped' by the screen boundary. This is wholly due to the careful design of BASIC and firmware rather than any special attribute of the routines themselves. Indeed if, say, DOTLINE were set up on a Spectrum with variables which put the start of the line off the edge of the screen, the program would stop with an error report.

Next month we will continue the development of the TOOLBOX and begin to pull the different routines together in a program which save and print pictures. Later in the series we shall be looking at extensions to these, and other routines, allowing us to ROTATE, STRETCH and COPY shapes as well as building and editing whole drawings. See you next month.

```
20000 REM ******************************
20010 REM *          PLOT END          *
20020 REM ******************************
20030 REM
20040 Z$=INKEY$ : IF Z$="" THEN 20040
20050 Z$=UPPER$(Z$)
20060 IF Z$="M" THEN MORE$="Y"  : RETURN
20070 IF Z$="D" THEN GOSUB 20800
      : REM SCREEN DUMP TO AMSTRAD DMP1
20080 IF Z$="E" THEN GOSUB 21100
      : REM SCREEN DUMP TO EPSON TYPE
20090 IF Z$="X" THEN END
      : END PROGRAM
20199 GOTO 20040
```

```
20400 REM ******************************
20410 REM *          YES / NO          *
20420 REM ******************************
20430 REM
20440 YN$=INKEY$ : IF YN$="" THEN 20440
20450 YN$=UPPER$(YN$)
20460 IF YN$<>"Y" AND YN$<>"N" THEN 2044
      0
20470 RETURN
```

```
20200 REM ******************************
20210 REM *           DRAWBOX          *
20220 REM ******************************
20230 REM
20240 PLOT Tlx,Tly
20250 DRAW Brx,Tly
20260 DRAW Brx,Bry
20270 DRAW Tlx,Bry
20280 DRAW Tlx,Tly
20290 RETURN
```

```
5 CLS
10 XS%=10 : XF%=200 : YS%=10 : YF%=200 :
    DS=5 : GOSUB 21500 : STOP
21500 REM ******************************
21510 REM *       DOTTED LINE          *
21520 REM ******************************
21530 REM
21540 TA%=XF%-XS% : TB%=YF%-YS%
21550 TQ=SQR(TA%*TA%+TB%*TB%)
21560 TX=TA%/TQ : TY=TB%/TQ
21570 FOR L=0 TO TQ STEP DS : XP%=XS%+L*
      TX : YP%=YS%+L*TY : PLOT XP%,YP% :
      NEXT
21580 RETURN
```

```
20600 REM ******************************
20610 REM *    PROGRAM FRONT END       *
20620 REM ******************************
20630 REM
20640 CLS
20650 Tlx=0 : Tly=398 : Brx=639 : Bry=1
20660 GOSUB 20200
      : REM DRAWBOX
20670 Tlx=10 : Tly=388 : Brx=630 : Bry=1
      1
20680 GOSUB 20200
      : REM DRAWBOX
20690 LOCATE 20-INT(LEN(TITLE$)/2),10
20700 PRINT TITLE$
20710 LOCATE 3,14
20720 PRINT "Press    S P A C E   B A R
       to start"
20730 z$=INKEY$ :IF Z$<>CHR$(32) THEN 20
      730
20740 RETURN
```

```
21100 REM ******************************
21110 REM *   EPSON TYPE SCREEN DUMP   *
21120 REM ******************************
21130 DIM i%(320)
21135 PRINT#8,CHR$(27);CHR$(65);CHR$(6)
21140 pixln=413
21150 FOR k%=1 TO 28
21160 pixln=pixln-14
21170 FOR l%=1 TO 320
21180 GOSUB 21280
21190 i%(l%)=p1%+p2%+p3%+p4%+p5%+p6%+p7%
21200 NEXT
21210 PRINT#8,CHR$(27);CHR$(75);CHR$(65)
      ;CHR$(1);
21220 FOR j%=1 TO 320 : PRINT#8,CHR$(i%(
      j%)); : NEXT
21230 PRINT#8
21240 NEXT
21250 PRINT#8,CHR$(27);CHR$(65);CHR$(12)
21260 ERASE i%
21270 RETURN
21280 p1%=TEST(l%*2,pixln)*64
21290 p2%=TEST(l%*2,pixln-2)*32
21300 p3%=TEST(l%*2,pixln-4)*16
21310 p4%=TEST(l%*2,pixln-6)*8
21320 p5%=TEST(l%*2,pixln-8)*4
21330 p6%=TEST(l%*2,pixln-10)*2
21340 p7%=TEST(l%*2,pixln-12)
21890 RETURN
```

```
10 CLS : X0%=200 : Y0%=200 : BASE=80 : H
   I=100 : GOSUB 21900 : STOP
21900 REM *****************************
21910 REM *      DRAW TRIANGLE        *
21920 REM *****************************
21925 REM
21930 WOFFS%=BASE/2 : HOFFS%=HI/3
21940 X1%=X0%-WOFFS% : Y1%=Y0%-HOFFS%
21950 X2%=X0% : Y2%=Y0%+2*HOFFS%
21960 X3%=X0%+WOFFS% : Y3%=Y0%-HOFFS%
21970 PLOT X1%,Y1% : DRAW X2%,Y2%
21980 DRAW X3%,Y3%
21990 DRAW X1%,Y1% : RETURN
```

```
10 DS=4 : XS%=200 : YS%=200 : R%=80 : CL
   S : GOSUB 22000 : STOP
22000 REM *****************************
22010 REM *        DRAW CIRCLE        *
22020 REM *****************************
22030 REM
22035 DS=DS/180
22040 FOR L=0 TO 2*PI STEP DS
22050 XP%=R%*COS(L) : YP%=R%*SIN(L)
22060 PLOT XS%+XP%,YS%+YP%
22070 NEXT
22080 RETURN
```

```
5 CLS
10 PLOT 100,100 : DRAW 100,200 : DRAW 15
   0,200 : DRAW 150,175 : DRAW 125,175 :
    DRAW 125,150 : DRAW 150,150 : DRAW 1
   50,100 : DRAW 100,100
20 MI%=2
30 XS%=125 : YS%=125 : GOSUB 21700 : STO
   P
21700 REM *****************************
21710 REM *          PAINT            *
21720 REM *****************************
21730 REM
21740 DIM XP%(200) : DIM YP%(200)
21750 HEAD%=0 : TAIL%=0
21760 GOSUB 21860
21770 TAIL%=(TAIL%+1) MOD 200
21780 XT%=XP%(TAIL%)
21790 YT%=YP%(TAIL%)
21800 IF TEST(XT%+1*MI%,YT%)=0 THEN XS%=
      XT%+1*MI% : YS%=YT% : GOSUB 21860
21810 IF TEST(XT%-1*MI%,YT%)=0 THEN XS%=
      XT%-1*MI% : YS%=YT% : GOSUB 21860
21820 IF TEST(XT%,YT%+2)=0 THEN XS%=XT%
      : YS%=YT%+2 : GOSUB 21860
21830 IF TEST(XT%,YT%-2)=0 THEN XS%=XT%
      : YS%=YT%-2 : GOSUB 21860
21840 IF HEAD%=TAIL%+1 THEN ERASE XP% :
      ERASE YP% : RETURN
21850 GOTO 21770
21860 PLOT XS%,YS%
21870 HEAD%=(HEAD%+1) MOD 200
21880 XP%(HEAD%)=XS% : YP%(HEAD%)=YS%
21890 RETURN
```

```
5 FF=0.3 : AR=0.75
10 DS=4 : XS%=200 : YS%=200 : R%=80 : CL
   S : GOSUB 22100 : STOP
22100 REM *****************************
22110 REM *       DRAW ELLIPSE        *
22120 REM *****************************
22130 REM
22140 DS=DS/180
22150 FOR L=0 TO 2*PI STEP DS
22160 XP%=R%*COS(L*AR) : YP%=R%*FF*SIN(L
      *AR)
22170 PLOT XS%+XP%,YS%+YP%
22180 NEXT
22190 RETURN
```





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Electric Dreamers

Virgin Games have an image of being so laid back that they often fall over! Simon Rockman went to investigate the source of Sorcery.

Many companies with a lot of money think that they can succeed in the home software market; after all, surely all it needs is a reasonable product and a lot of hype. Initially Virgin fell into this trap and published the best of the poor software sent to them in response to the 'Be a star!' advertisements they put out. Despite the popularity of The Laughing Shark character portrayed in their advertising, the actual software acquired a poor reputation.

Virgin had learnt the hard way that word-of-mouth is the best way to advertise software, and re-trenched for a second attack on the home software market. It is lucky for the CPC464 that it arrived whilst Virgin were climbing back in the software stakes. The result is Sorcery - the best game for the Amstrad computer yet.

Rapid expansion

Virgin are based just off the trendy Portobello Road, filled with quaint shops and a street market. The road in which the main offices are situated, is a cobbled street. Behind builders' skips and scaffolding, a handwritten sign proclaims 'Virgin this way....'. Inside, the builders are at work. The place smells of plaster and fresh paint - pillar box red. Since Virgin started as a record company they have grown. The records, films, video, and airline departments are in an adjacent road, and the games division has not yet moved in (preparations are being made). The receptionist handles the switchboard like a typewriter, dealing with the large number of calls. Somewhere in the background, above the noise of the builders someone is discussing 'products' and 'units'. Virgin is a very busy place.

The actual programming is done down the road. Behind an elegant Edwardian door there is a swish reception, a telex, and yet more building work. One room looks lived in - the programming room. The place is the nicest possible kind of tip, a sort of computer scrapyard. Having just returned from a computer show, much of the stuff is piled up on the floor. Apparently it all used to fit on the shelves, but having been removed, mess has accumulated in its place and there is no room for the equipment. A QL sits on a shelf, covered in dust. This is where Sorcery was written.

Quick as a flash

A lot of work went into the game and this shows right from the moment that you start to load it. The program uses a system called 'Flashload' - a high speed loader. All recent Virgin games use some kind of high speed loader. This was essential with the Commodore 64 which loads at about a third of the speed of an Amstrad speedwrite 0 program. So although the need was not so great on the Amstrad, it was decided that the 2K of memory used by the tape buffer was too valuable to waste and so some kind of custom loader was required. This caused a lot of problems and only came right in the end. The original idea was to load at 4K baud (four times speedwrite 0) but whilst this was okay most of the time, it proved too unreliable to be used in the manufacture of a large quantity of tapes. The speed was cut down 'bit by bit'until a reliable enough result was obtained. The production tapes load at 2.5K baud but without the usual gaps between blocks. Even so it is a large

game and takes a while to load. The possibility of a disc version is a sore point, since their disc drives were still on order. The whole game was developed using a tape based system and Devpac.

All done on an Amstrad

Development systems are a matter of taste. Some companies like Abersoft (who wrote Forth) share mainframe computers, some use mini computers and some use different micros, the Apricot being a favourite. Programmers tend to stick with the systems they like or have good utilities for and write their programs on that. They use a link to transfer the software to the machine it is intended to run on at the last minute. Virgin are one of the few major software houses to do all the work on the machine that the program has to run on. Dave, who wrote most of the program for Sorcery is quite happy working like this, however Andy dislikes the Commodore 64 he is working on and would much rather use something with fast discs.Utility software is important and in addition to Devpac 2, the Virgin team use a multi colour character definer they have written. All the graphics are produced by Ian who created the forty breathtaking rooms with only 256 characters. The definer itself is complicated to use, and there is no intention to release it as a separate program.

Magical tricks

If you have seen the game you will know that the top of the screen is in mode 0 whilst the bottom is in mode 1. This is done by waiting for the electron gun in the monitor to get half way down the screen and then swapping the mode. This gives plenty of scope for the graphics, with 16 colours at the top, and nice text at the bottom. The book which forms a timer disappears four pixels (dots) at a time since this was the easiest way to write the program since four pixels correspond to a whole byte.

A bug!

There is one, minor, bug in the program. When your sorcerer flies behind a waterfall he sometimes leaves a copy of himself behind the water. Initially Dave attributed this to 'refraction' but then admitted that this was the way his sprite routine worked by using XOR. He pointed out that there were no rooms where two monsters of the same type could cross since this would cause them to disappear. Being a Spectrum programmer this was the first time he had been given so many colours to play with. Ian really went to town



Dave proves he's an AMSTRAD wizard

with the graphics. There are a lot of little things to notice in the game, and things like which cauldron is friendly and which is evil, depend upon your starting position in the game. There is an odd message if your name is Hugh and you manage a high score. All these little things improve the game.

The future

There are two projects being considered for the future. The first is Strangeloop, a conversion of the Spectrum hit, and the second is as yet without a name or storyboard. All in all, there should be four more programs from Virgin this year with a particularly good one saved until Christmas - yes it does seem a long way away. Having established such a good reputation on the Amstrad machine it is important that all the follow up software is as good. Overseas readers will be pleased to hear that Virgin will export its software, notably through Virgin France.

Dave refused to be drawn on the unnamed game, saying that it could be anything, although it was unlikely to employ wire frame graphics - they lack colour, and his expertise is in moving large, pretty shapes smoothly across the screen. Any future programs will have more exciting sound, in stereo.

Whatever happens, Virgin are a name to watch. Now I must grab my joystick and find out what the crown does...

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Access

QA

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Of little faith...

Q: Thank you for sending me detailed information about your CPC464 computer. I am most impressed as it seems that I can combine at a low price, a games playing home computer and a machine that will run a lot of more serious programs if I get your disc drives. Is it really as good as it sounds? For example, I would want to use it for word processing: can I run the CP/M version of Wordstar on your machine? What other existing CP/M software will run on your machine?

C. E., Fife.

Amstrad User: Of course it's as good as it sounds! It is possible to run a version of Wordstar on the CPC464; the following company should be able to supply this and much other CP/M software in the CPC464 format:

Timatic Systems Ltd.
Newgate Lane
Fareham
Hants
PO14 1AN.

Character sets

Q: I am considering buying an Amstrad CPC464 microcomputer. Having completed a thorough examination of the sales literature a number of my questions remain, as yet, unanswered. One of my main intended applications is fairly complex in nature and so it is necessary to know before purchase whether the CPC464 is able to carry out the task.

The function is to manipulate natural language texts written in different scripts to that of our Roman type, for example, Asian texts written in Hindi, Punjabi, Gujurati. (written from left to right) and Urdu (written from right to left). To implement these scripts would mean creating new character sets and redefining the keyboard. As you will see from example scripts I have enclosed, some characters are quite complex and so the standard 8 x 8 character dot matrix found on many micros would not be sufficient.

Is it possible therefore, to redefine and increase the dot resolution of each individual character matrix from that of 8 x 8, to say, 12 (wide) by 16 (high)?

I am a graduate computer scientist and am employed as a Software Engineer (mainly assembly language) and so if the solution can be resolved in purely software I should be able to handle it myself.

Could you help me by giving a brief technical summary of the necessary software and/or hardware steps required to implement the system.

Also, as I would like to make a purchase of a 'complete' system very soon, could you please advise concerning compatible printers.

A.C., Birmingham.

Amstrad User: It is not possible to (easily) increase the standard 8x8 character dot matrix, however it would be possible for you to define the larger characters over four character squares in one block -but on the whole, you are trying to extract too much from a computer designed to sell at such a low price.

However, some readers may have other ideas and we invite anyone who has successfully installed other language character sets to write and tell us.

HiFi

Q: Is a standard lead to be marketed to connect the CPC464 to a hi-fi system? If not what is the type of jack required, and input characteristics for the amp?

Amstrad User: You will require a 3.5mm stereo jack plug.Try your local Comet service centre, and take along the manual for the computer and the Hifi. The plugs and sockets are 'standard' -but there are so many permutations available that this is the safest solution.

April fool!

Q: I have received a joystick and Codename Mat as a result of my order in November. My son played Codename Mat as soon as we received it, and derived much pleasure from it, but the joystick was a Christmas present and no-one used it until the past few days. My son found the joystick impossible to use with Codename Mat, but is very easy to write programs for and use in that way. I have just used the joystick with Codename Mat, and I'm afraid there is something wrong. If you press the joystick up, the stars move up, down and the stars move down. However, press the stick left and the stars move right and vice versa.

Thus the fault seems to be in the program and not the joystick. It makes the game unplayable.

K.M.C., Worcs.

Amstrad User: You do not have a fault with your joystick or software.

'Codename Mat' includes a feature with a tracking computer which is supposed to give the illusion of looking behind you (like when you are reversing in a car), and therefore the directions are reversed.

In order to get out of this screen, press K to switch off the tracking computer.

Frame up

Q: I am having difficulty with apparent colour reversal. The problem occurs with the "WIRE FRAME GRAPHICS PLOTTER" listing, (page 26 of Issue 1 -CPC464 User).

Unless I am going mad, Line 120 sets up 3 "i%" variables which are used in line 160 to set the Border to White (i2% = 13), the Paper to Brilliant White (i0% = 26), and the Pen to Black (i1% = 0). i.e. I should get Black "writing" on a Brilliant White background with a White Border. What I actually get is Brilliant White "writing" on a Black background with a White border. i.e. a complete colour reversal. And the instructions in Line 180 do not appear because they are apparently being printed Black on Black in the text window (Line 90 hash 0).

I then tried replacing the variables in Line 160 with the real values, by entering 160 CLS:CLS #1: CLG: Border 13: INK 0,26: PAPER 0: INK 1,0: PEN 1 . However, this still gives the colour reversal - See "TEST2".

Finally, I put a REM in line 160 after "CLG:" and before "BORDER" and the program works perfectly, albeit in Blue and Yellow - see "TEST3".

I also have a SAVE problem. If I use an old tape, on which I have previously recorded Spectrum programs, it fails to save 70% of the time, although appearing to save, or perhaps it does save but cannot sense the program when I CAT or LOAD. The only answer seems to be to use unused tapes or erase all tapes before use in an audio recorder. A bit inconvenient. However, will you pass this on to the appropriate quarter so that any other CPC464 users with SAVE problems can be advised.

D.C., Dagenham.

Amstrad User: The errors are caused by the fact that you used a lower case l (L) instead of the number 1 (one) when entering the data. The program should work successfully once this correction has been made - and is one of the main reasons why we now try hard to produce the unambiguous OCRB typeface listings where such problems do not arise! Regarding the SAVE problem - use new or completely erased tapes. Tapes previously recorded by other computers may be over saturated, or tape head alignment may be inconsistent. This problem occurs frequently using tapes recycled from other sources - and it's not a fault.

Adventure's end

Q: I recently purchased Amsoft's "Classic Adventure" and I find it very enthralling, but alas I am stuck in "The Hall of The Mountain King". This is where the huge green snake lurks. Could you please help me get past him, and send me some information on future adventure games and programs etc. I would be very grateful.

J. Livermore.
Australia.

Amstrad User: Drop the bird. (Don't for heaven's sake ask why!)

How about a feature from a Classic Adventurer on playing the game?

'Level 9' produce several excellent adventure games for the CPC464, you should add these to your collection.

The falling £

Q: I recently tried to type in a program which included the £ sign. When I listed it, the £ sign was missing. I then tried to just type in one line :10 £ = 1. When listed it read :10   = 1. I then tried typing in 10 "£". It listed correctly. So, the £ sign only registered when in quotation marks.

So, is my computer showing a fault or am I doing something wrong?

Amstrad User: When you come across the pound sign in a listing, you should substitute it for the hash (#) sign. You will only be able to print a pound sign if it is entered within inverted commas. Many dot matrix listings contain this transposition, and it's just one of the bits of computer folklore that newcomers have to learn the hard way. Sorry!

Strung up on string

Q: It seems impossible to make a single key clear the screen without using a CLS command in a function definition. It would be useful if defining a key, e.g:

```
KEY DEF x,0,12,12,12
```

would do this rather than producing an inverted fir-tree.

You can program a key:

```
KEY 0,"CLS"+CHR$(13)
```

in order to achieve single key stroking of CLS. Obviously it would be more appropriate to set this string to a control key on the main part of the keyboard with:

```
KEY DEF x,1,y,y,141:KEY 13,"CLS"+CHR$(13)
```

Amstrad User: The fir tree symbol is the conventional symbol for a new page and will cause a CLS if it is PRINTed (having been typed in within quotes). Simply striking a key and having a symbol appear on the screen is not the same as printing that symbol; otherwise it would be impossible to type those symbols into strings.

Q: Looking through the grille at the rear of the computer it is possible to see that there are 4 position links (marked LK1 to LK4) which are not visibly 'made'. What are they for?

Amstrad User: The links you can see are for setting manufacturing options and in any particular machine will be postioned appropriately. They should not be altered. The disc drive interface box also has links inside, which again reflect manufacturing options and should not be altered.

Caved in

I recently purchased a game called 'Roland in the Cave'.

Q: Every time I fall down the pit, either the pterodactyl gets me or I fall straight on to the plants which hold me down until the bird gets me, so please could you tell me how to work the thing; I think it is impossible. Could you please reply telling me how to work it because I have read the instructions and I still don't know.

M.B., Rainford.

Amstrad User: 'Roland in the Cave' is a very difficult game and is intended to stretch your gamesmanship. It is possible to get out of the cave and I can assure you that many people can now do this. Jump right before doing anything else! Jump left as your first move and you are guaranteed to end up as pterodactyl fodder.

Runtime PASCAL

Q: I recently purchased a copy of HiSoft Pascal 4T, and am steadily learning this language.

I have run up against a difficulty and would appreciate your help. I copied the example program, which runs perfectly satisfactorily. Evidently however, it does so only whilst the compiler remains in memory.

I am interested in using the object code produced by the PASCAL program without having the compiler in memory.

To obtain such object code I used the Translate Command T from the editor second program into memory.

W.B., Glasgow.

Amstrad User: The problems you are having loading your data, is due to the fact that you are using:

```
LOAD "filename"
CALL entry
```

The idea is that you just use:

```
RUN "filename"
```

The reason the machine says "memory full" is that you are trying to load binary on top of BASIC space.

Letter Quality Printing and the CPC464

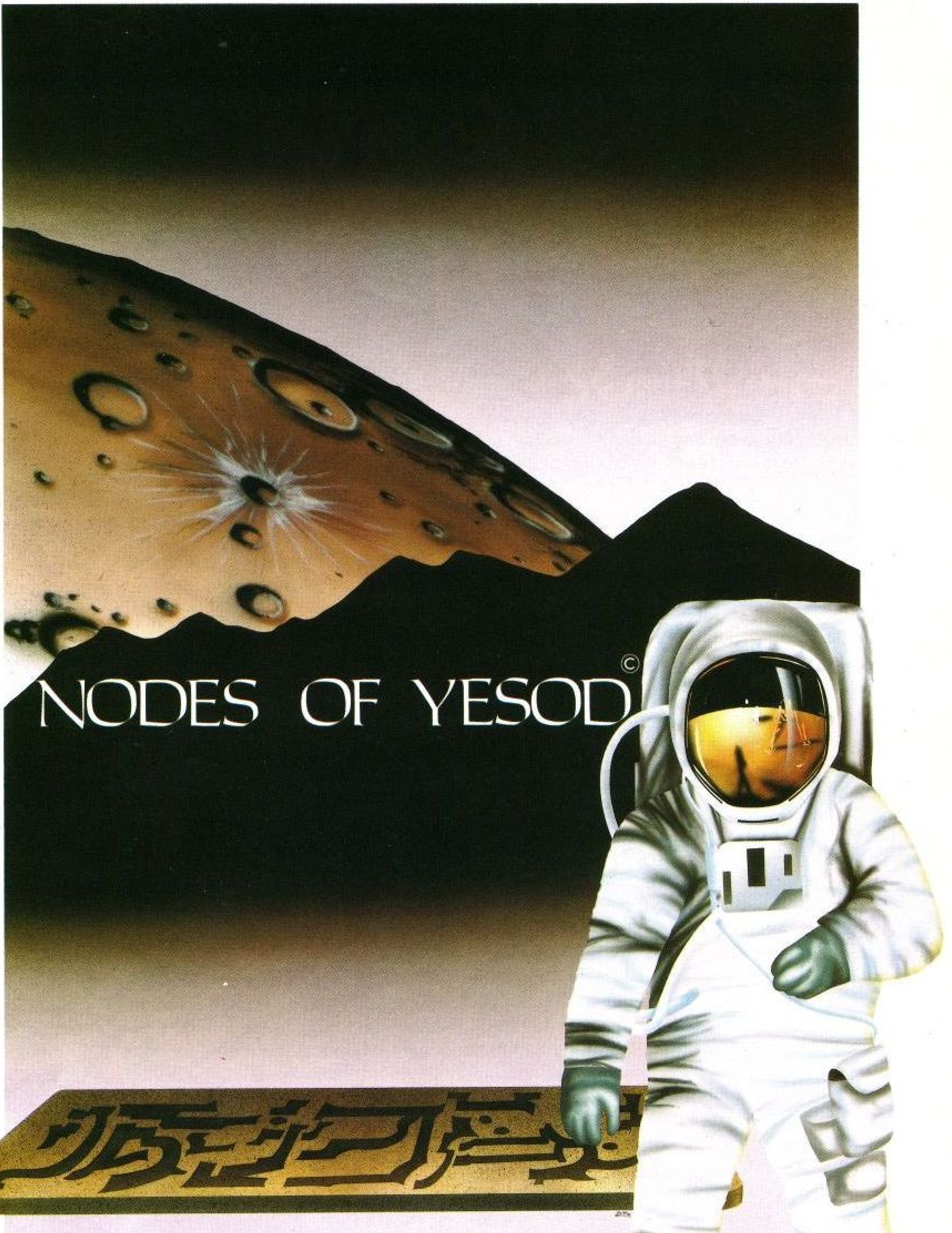
Q: I wish to buy a printer/typewriter of the "Brother" or "Olivetti" etc. type for my 464. But your parallel port is only 7 bits & you have no serial port -will a parallel printer of this type still work, or should I need to buy the "add-on" parts elsewhere?

The manufacturers/sales people do not know, I cannot try it and see, so it's up to you I am afraid.

Anon

Amstrad User: Although the printer port has only 7 bits, this will only have an effect if you purchase a printer with the intention of using it for graphics with characters above 127 (decimal): thus most daisy wheel printers are not bothered.

Brother daisy wheel printers (and most others) work perfectly well with the CPC464.



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PRESTEL - *Living by numbers*

Asking the question 'What is Prestel?' is a bit like asking the question 'What is television?'. You can give the technical answer along the lines that a television is a device which allows you to see pictures produced from anywhere in the world and that it splits a picture up into lots of tiny dots which are sent through the air to be joined up again in your front room. However this fails to answer the real question 'What is the use of television?'. In a similar sense Prestel is what you make of it. If there is nothing worth watching you can quite happily live without it, however once you start to use it you can get hooked.

Background

Before we delve into the contents of Prestel lets have a brief look at the history and workings of the system.

In the early '70s, when *British Telecom plc* was still the GPO, the bods at the Post Office were looking at ways to increase the usage of the telephone system. Most homes with a telephone also had a television, and if you could pursuade the viewers to link the two you had a potentially massive market. This was at a time when home computers cost three months wages and were very rare and so a full keyboard was not envisaged, all that was needed was a keypad with the numbers 0 to 9 and the symbols * and #.

The standard that was agreed upon was similar to that being played with by the BBC and IBA for teletext (Ceefax and Oracle), but there the similarity ends - as a service they are very different.

The viewer could select a page of information by pressing * page-number #, or by just pressing a number from a menu page and being taken to the next one on that route. This meant that very little information had to be sent from the home to Prestel for every whole page which was sent the other way. Since the amount of information which can be reliably carried on a phone line is limited (especially if you want to keep the cost down) the rates of transfer were designed with this in mind. Information is sent from Prestel at 1200 baud (bits per second), which is a little faster than Amstrad speed write 1. The minimal selection information crept back down the wires at 75 Baud. The system worked and still works that way with a few minor improvements in terms of the features which are allowed.

Since the object of the exercise was to make money for the Post Office, it was decided that both the people providing the information (called Information



The opening page of Micronet

Providers or IP's) and the viewers should pay. The IPs rent memory on the Prestel computers and have the option to charge anyone looking at a specific page. The charge is split between Prestel and the IP. Users have to be registered. For this they pay £6.50 a quarter plus extra fees to join clubs which allow them to look at special pages. These clubs are called 'Closed User Groups' or 'CUGs'. This all results in quite a complex billing system, and it has been said that billing software cost so much that it would have been more profitable for the GPO to offer the pages for free and just make a profit on the 'phone calls! There is a time charge for using the system during working hours and before 1pm on a Saturday, however this does not really affect hobbyist users.

What can Prestel do?

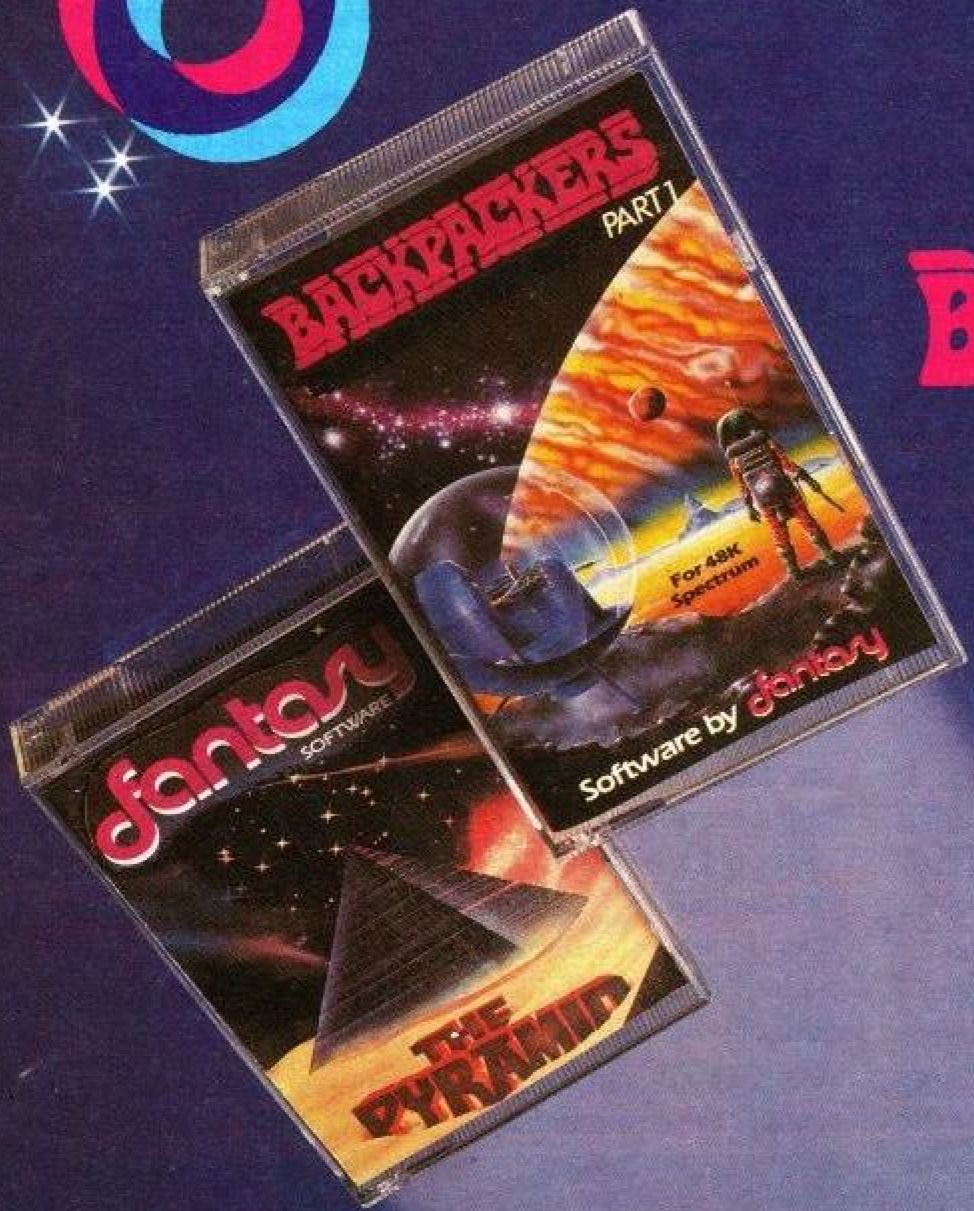
Prestel is a *Viewdata* system and conforms to a European/Common Market standard. The standard allows you to have eight colours on a screen, forty characters across and twenty five deep, with only 1K of screen memory. It does this by using special characters to mean *change to a given colour*; from then on everything on that line of text is printed in that one colour. There are special codes to change the background colour and to provide flashing and double height characters. It is possible for the IP to build up a page with special conceal and reveal codes so that the user has to press another button to produce an item of information -such as the punchline for a joke.

All these features require some smart software at the receiving end. There are some special chips to do the work, but these are unecessarily expensive and most home computers produce the graphics by using clever software.

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Mouse presents hardware reviews

One of the latest features of Prestel is the dynamic page. Usually a page only shows a static image, either text or a diagram made up out of shapes to produce an image with a resolution of 80 by 75, although you can only change the colours in steps of 40 across and 25 down. By using a dynamic frame it is possible to animate the graphics. This works by sending commands to the user's system to move the cursor and then print another bit. To conform properly to the international Viewdata standard, the software needs to be able to handle all these features.

With the advent of home computers logging into Prestel, there is a further direction for expansion. Because a program is just a bunch of data and since all Prestel is really doing is handling data, it is possible for the system to send programs to you. This is done using a protocol called *telesoftware downloading*. A standard needs to be established for each computer - and as this has not yet been done for the CPC464 there is no Amstrad software on offer.

Despite all the ways in which British Telecom earns money from Prestel, it has never made a large enough profit to cover the setting up and running costs......... because not enough people use it. The advent of the home computer and in particular the CUG for home computer users has started to change that.

Micronet

Micronet is the big success story of the system. It provides magazine-type information for computer freaks. Micronet provides daily news, all of it well written and some of it embarrassing to the computer industry (where else could you get daily updates on the bugs in the QL?). Micronet also provides most of the telesoftware plus educational sections on languages and programming.

Prestel microcomputing also encompasses *Clubspot*, which is provided by the Association of Computer Clubs. This section is put together by a dedicated band of enthusiasts has lots of local news, although some of this is often closer to being history than news.

Micromouse is one of the fun sections on Prestel. A kind of gossip column that tells you of the latest exploits in the world of hackers (people who gain unauthorised entry to computer systems) and provides some insight into the world of 'phone phreeks' (people who build little boxes which allow them to make worldwide 'phone calls for free). There is plenty of gossip from the computer world which recently included some information on how insecure bank and credit cards are. The style of this area is very individualistic. The IP, called Micromouse by Prestel ('Squeaky' to his friends), fills the articles with atmosphere by referring to 'pooters instead of computers and mice instead of people. With a lot of contacts in the 'US of A', Micromouse is often first with the news and always first with the rumours.

Homelink is the service which can most easily be used to justify the expense of the system. The Bank of Scotland and the Nottingham Building Society provide home banking facilities, and from the comfort of your own home you can inspect your bank account, pay bills and move money from one account to another. Like most on-line systems, Homelink is just getting by. In America this kind of set up is much more popular - which is annoying since the Scots invented the telephone and the television. Perhaps our time will come and all the work put in will be hugely profitable.

It is not possible to cover a vast subject like Prestel in one feature. There is much left to talk about: the user to user mailboxes, telex links, shopping from home, telebetting, timetables, and megabytes of general information.

As with all computing, all you need is the time, the money, the equipment and the money.



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"At last, a conversion to the Amstrad that takes full advantage of the machine's additional colours ... **without doubt the most strikingly produced game I've seen to date for the Amstrad.**" *(C.T.W.) "Wonderful ... the graphics are beautifully designed to an incredible degree of detail. This cartoon detail extends throughout all 40, quite different, screens." (PopCompWkly) "Stunningly sharp, colourful graphics and a truly infuriating and fascinating plot ...* **certainly the best game yet for the Amstrad.**" *(Micro Adventurer)* Quite simply one of the best programs there is. Fantastic! STICK NEEDED. (VIRGIN) **CASSETTE £8.95**

FIGHTER PILOT

"THE FLYING IS THE BEST I'VE COME ACROSS ... Fighter Pilot has the edge for its spectacular combat, but it wins too on graphics and instrumentation." (PCGames) "A superb flight simulation with full instrumentation and marvellous moving horizon cockpit views ... a cut above the rest." (Computer Choice) STICK or KEYS (DIGITAL) **CASSETTE £8.95**

EMERALD ISLE

The latest of Level 9's marvellous adventures. 240 beautifully drawn locations, plus over 30K of well-written text.2 full-colour posters free and a clue sheet is available, too. Because this is a bit easier (!) than the usual Level 9 adventure, it's also £3 cheaper. An astonishing bargain! NO STICK (LEVEL 9) **CASSETTE £6.95**

MINI OFFICE

"Quite exceptional value ... the first affordable program suite ... I strongly recommend beginners get this first." (PersCompNews) 4 programs on one tape, all working with Epson-compatible printers. **WORD PROCESSOR:DATABASE:SPREADSHEET:GRAPHICS.** the perfect introduction to these classic programs. NO STICK (DATABASE) **CASSETTE £5.95**

JET SET WILLY

"Texhnically brilliant, funny and of course, completely addictive." (PopCompWkly) "The first to combine the zany action of platform games with an adventure." (PCGames) The most famous of all micro games. It is a classic: it is absolutely magic. 60 screens - each one beautifully animated and each one demands that you learn different tricks to survive. STICK OR KEYS (SOFTWARE PROJECTS) **CASSETTE £8.95**

FOOTBALL MANAGER

"Has to be one of the best strategy games available ... I doubt that this game will ever be bettered." (CompwithAms) "AN EXCELLENT SIMULATION, ENJOYABLE TO ANYONE WITH THE SLIGHTEST INTEREST IN SOCCER." (PersCompNews) The best football manager game there has ever been for any micro. 3D animated graphics too. NO STICK (ADDICTIVE) **CASSETTE £7.95**

MACHINE CODE TUTOR

"Colourful, clear, interactive computer teaching package - the best I've come across in any field." (PopCompWkly) "Well thought-out, aesthetically pleasing and (as I could tell) bug-proof and crashproof ...an excellent idea, well-executed." (Computing Today) Over 70K of data loads in 4 parts from 2 cassettes, with lessons and exercises to teach you complete machine-code. Clear, helpful manual. NO STICK (NEW GENERATION) **TWO CASSETTES £4.95**

HOME BUDGET

One of the most sophisticated 'Home Budget' programs we've seen. Easy to use, very friendly and good crashproofing. Enter your monthly likely expenditure under your own 12 headings and likely income under 6 headings. View the results by quarter as figures or 3D bar charts. Printer o.k. NO STICK (Kuma) **CASSETTE £19.95**

PYJAMARAMA

"A MUST FOR ANY GAMES PLAYER and a classic of its type." (ZX Computing) "Definitely a game worth considering, if only for the graphics and the humour." (Amstrad User) 'As a simple combination of imaginative graphics, large characters and humour, PYJAMARAMA is unbeatable." (Crash) STICK OR KEYS (MIKRO-GEN) **CASSETTE £8.95**

MASTERCALC 464

"The easiest program of all to use ... the manual is by far the best." (PopCompWkly) "There is a professional feel about it which makes it stand out from the rest." (PersCompNews) The quotes refer to the Spectrum version. This one is even better! The perfect spreadsheet for the Amstrad. All m/code. Up to 3,000 cells. 0 - 7 decimal places. Variable column width. Insert/erase column/row. GRAPHIC BAR CHARTS. Hi-res screen copy from Epson-compatible printers. **DISK TRANSFER EASY.** NO STICK (Campbell) **CASSETTE £20.00**

SPECIAL OPERATIONS

"Special Operations has class and makes good use of graphics." (Computer Choice) "It requires imagination and careful planning to play well ... creates the proper atmosphere of stealth and desperation." (Sinclair User) A wargame, not an adventure or arcade game. Set your own time-limit; select your own team; control the action. 7 play levels. Split-screen text/graphics as your team win ... or not. NO STICK (Lothlorien) **CASSETTE 6.95**

MASTERFILE 464

"The definitive RAM database for the CPC464 computer ... a must for the serious user." (John Campbell) That's just the author talking, but Masterfile 464 is a development of the sensational Spectrum program he wrote. It is the most flexible, most sophisticated filing system you will find for the CPC464. All m/code and, now, with relational files (which is jolly clever.) NO STICK (Amsoft) **CASSETTE £24.95**

TECHNICIAN TED

"Some of the liveliest, detailed and imaginative graphics I've seen ... it must be a game to add to your collection. Truly amazing, truly difficult, truly wonderful;." (Crash) 50 screens in the Manic Miner tradition, but better. 27 tasks to be completed, within time limits. A very good platform game indeed. STICK OR KEYS. (Hewson) **CASSETTE £7.95**

THE QUILL

"A MASSIVELY WORTHWHILE INVESTMENT ... ALMOST LUDICROUSLY UNDERPRICED FOR WHAT IT DOES." (Crash) "Using this, anyone with the minimum of experience can construct an adventure ... You really can create games as good as those available commercially." (PopCompWkly) Without any knowledge of machine-code, you can write a m/code adventure with over 200 locations connected, described and filled exactly as you wish. Then sell it, if you like! 52-page manual. NO STICK. (Gilsoft) CASSETTE £16.95

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Total Order	

Hanging on the telephone

The Protek 1200 Modem is the first readily available means for hooking the Amstrad up to the outside world. How good is it?

There are three things to bear in mind when connecting a CPC464 with a telephone line.

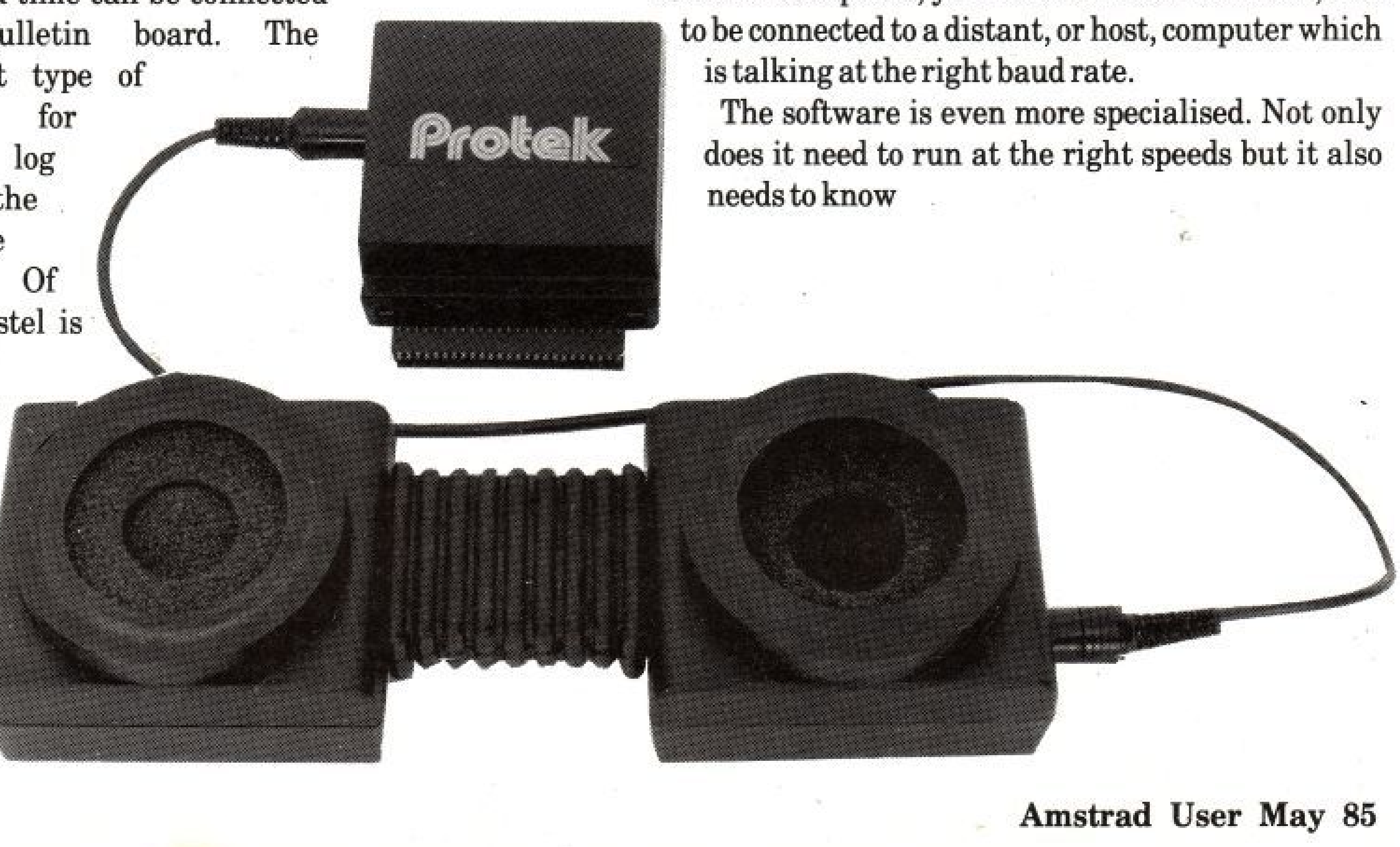
i) What do you want to connect to?
ii) What kind of serial interface and software do you need?

....and,

iii) What type of modem do you need?

To answer these questions in order:

There are several types of computers which can be called up with a modem. The simplest is just another user. For this all you need is the right modem and software. Next up the scale is the bulletin board. This is a database run on a small computer, usually by a private individual. As a rule only one person at a time can be connected to a bulletin board. The commonest type of database for users to log into is the mainframe database. Of these, Prestel is the most important.



A serial interface runs at a certain speed. It is possible to build an interface which can run at all the speeds you are ever likely to need, however this is an expensive solution. There are two main speeds required for connecting to other computers. The first is 1200/75 baud. This means that your computer receives information at 1200 bits per second and sends it at 75 bits per second. This is ideal for logging into a database but a bit slow for user to user. For bulletin boards it is more common to use 300/300. Both these speeds are used 'Full duplex' which means that the computers at both ends can 'talk' and 'listen' simultaneously. For user-to-user applications, it is possible to take it in turns to talk and listen. This is called 'half duplex' and is usually done at 1200/1200. For all these speeds, you need a modem to match, and to be connected to a distant, or host, computer which is talking at the right baud rate.

The software is even more specialised. Not only does it need to run at the right speeds but it also needs to know

SHINECREST

COMPUTER WORKSTATIONS AND DESKS



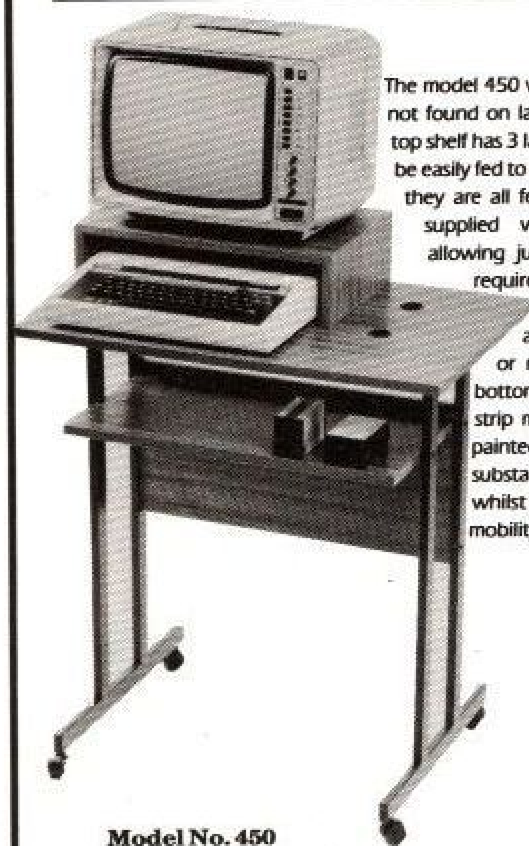
Model No. 600

The latest addition to the Shinecrest range has been enthusiastically received by both dealers and home computer owners for providing all the facilities a computer user could require. Shown in our photograph with the Amstrad CPC464 you can see there remains plenty of space both behind and alongside the computer. The raised shelf provides ample room for your monitor, and if you choose, a printer. Any weight will be easily supported as all the shelves are fitted to two metal rails which travel the full width of the desk and locate into the metal ends. Castors provide an often needed mobility for your desk. The shelves are supplied in a Teak woodgrain finish to compliment the dark metalic brown painted metal rails and end frames.

At the back of the desk there is ample space above and below the courtesy panel for interconnecting leads and paper feed to the printer. Every requirement has been provided for.

Dimensions		
	Distance between top and middle shelf	146 mm (5 3/4")
	Distance between middle and bottom shelf	216 mm (8 1/2")
	Depth of plinth	292 mm (11 1/2")
	Depth of bottom shelf	320 mm (12 1/2")
	Width	983 mm (36 3/4")
	Depth	610 mm (24")
	Height	889 mm (35")

PRICE £69-95



Model No. 450

The model 450 workstation has many features not found on large desks twice the cost. The top shelf has 3 large holes to allow the leads to be easily fed to the back of the unit. Once here they are all fed into a 4 into 1 masterplug supplied with the workstation, thus allowing just one lead (supplied) to be required for mains electricity. The pre formed plinth is moveable allowing it to be used either left or right "handed". Fitted to the bottom edges is a non slip rubber strip making your monitor safe. The painted metal frame provides substantial strength and stability whilst the fitted castors allow easy mobility.

Dimensions		
	Depth of plinth	296 mm (11 1/2")
	Width of plinth	478 mm (18 3/4")
	Distance between lower shelf and working shelf	178 mm (7")
	Width	762 mm (30")
	Depth	500 mm (19 3/4")
	Height	743 mm (29 1/4")

PRICE £59-95



Model No. 500

An attractive piece of computer furniture the model 500 also provides all the computers users requirements. A full width monitor shelf allows easy left or right handed operation whilst still providing space for the printer. The large work surface gives plenty of room for your Amstrad computer with ample "working room" still available. A unique Shinecrest development allows the desk to be mobile by the fixing of 2 painted metal castor supports. The very large courtesy panel ensures that the desk is stable and solid and will not "rock" like some models available. The back is "cut away" to allow unobtrusive removal of leads. The model 500 is available in a Teak woodgrain finish.

Dimensions		
	Depth of plinth	296 mm (11 1/2")
	Distance between top and middle shelf	130 mm (5")
	Width	965 mm (38")
	Depth	590 mm (23 1/4")
	Height	865 mm (34")

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the protocol for sending characters. For systems like Prestel, a kind of software known as *viewdata* is required. For logging into bulletin boards or communicating with business type services you need 'glass teletype' software. Again you need to decide before you buy; the software can make or break a package.

Finally the modem. The first distinction to be made is between the acoustic coupler and the hardwired modem. A coupler fits over the mouthpiece and earpiece of a normal telephone. A hardwired modem plugs into the wall in the same way as a modern telephone. Acoustic couplers are usually battery powered, whilst hardwired modems tend to run off the mains. Since all you need to use an acoustic modem is a standard 'phone, it scores in being portable. However any noise in the room can cause the sounds being transmitted to be garbled. This makes a hardwired modem more reliable.

Options

Whatever type of modem you buy, you will need it to run at the right speeds. More expensive modems are switchable and allow you to dial up a selection of hosts. These multi-standard modems are nearly always hardwired since the physical coupling of the acoustic modems forms part of the frequency dependent 'circuit' that is specific to one modem speed.

Since a modem is in many ways similar to a telephone it is not surprising that a hardwired modem can be made to both dial and answer. An auto-answer modem needs special software which will look for an incoming call.

How does the Protek 1200 and Amstrad serial interface package rate in this field of choice?

For a start it will run at 1200/75 and 1200/1200 half duplex. This means that it can be used to communicate with Prestel and as a user-to-user system. There are very few bulletin boards which run at 1200/75, a notable exception being VISA which is on between 8pm and 11pm every night on 01-959-7098. Like Prestel VISA uses viewdata format.

The serial interface is small and neat. It is well constructed with a minimum of components. A cable joins the interface to the modem. There are two flaws in the design of the interface for the 464- both to do with the connectors. The first is that there is no locating lug in the socket which plugs onto the back of the computer. Because of this it is easy to plug the interface in and then find that the screen goes awry when you turn the power on. Secondly, the socket at the back of the interface should allow you to connect any other additional accessory; however, the disc interface will not fit on, partly because the box is too big and the connector does not protrude, but mainly because the printed circuit board at the interface end is too wide to fit into the slot in the disc interface box. I understand that Protek intend to rectify this soon.

The viewdata software is adequate. Because Prestel uses a weird screen format, it is not possible for the CPC464/664 to simulate it completely. Prestel needs eight colours and forty columns for text. The Protek software provides four colours. Red, blue, black and white. For this reason some of the frames look a bit anaemic, but this is a fair compromise. Not all dynamic frames work properly, the colour very often leaves a trace which should disappear. There are options to save a screen to tape and to print a frame. It is a great shame that a disc cannot be used (yet), as this will make it far cheaper to save frames.

Logging on

Before you log in, you have to type your ID. This means that anyone looking over your shoulder gets a good look at this supposedly secret information.

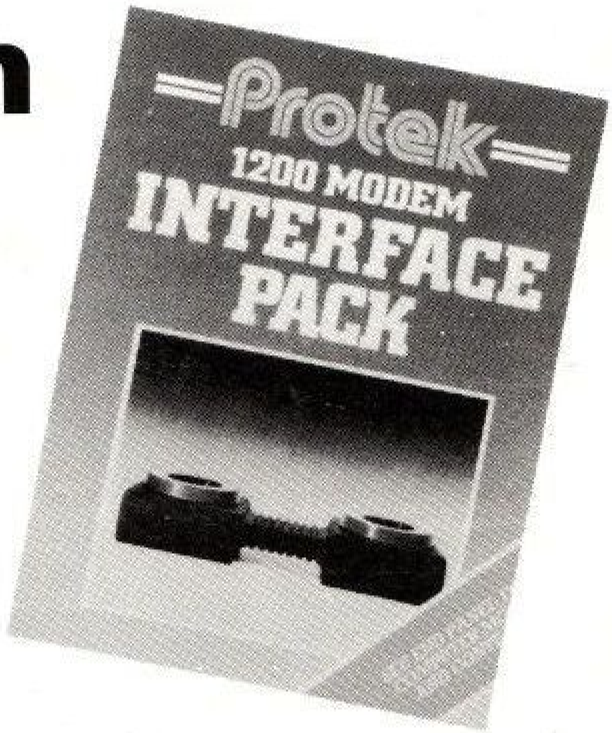
Perhaps the most annoying omission is the lack of a cursor when using the mailbox or response frame pages. Further, there is no 'reveal' option, but despite all this, the combination of interface and software is a bargain at £29.

The modem itself is of the acoustic type, and it fits the standard telephone well. There are two sets of batteries to be fitted into the modem and as you join the telephone to the handset the lids on the battery compartments tend to open. When the batteries are new the modem performs very well, but as they start to run down, the amount of 'line noise' (corrupted information) increases - so stick to alkaline types. There is a three way switch to set the modem to 1200/75, 1200/1200 or OFF, and an earphone socket. Although not spectacular, the modem is a good solid device with BT approval. The price tag of £59.95 for the modem is quite reasonable for a BT approved device, and what's more, it's available!

All in all a neat little package, and for less than £100, it is a cheap way to get into the world of communications.

Protek Computing Limited,
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☎ (0506) 415353 ■

Protek Modem Competition



The Protek modem will allow you to connect your computer with other computers all over the world. All you need is a CPC464 and a telephone. This plug-in and go package includes a modem, interface and the right software. Each prize is worth nearly £100.

How to win

In the square below there is a jumble of Locomotive BASIC keywords. Get out your manual and see how many you can spot (left to right, and top to bottom).
When you think that you know where they all are, fill in the entry form and ring all the words.

Rules:

1. The winners will be the first six correct entries drawn on May 31st 1985.
2. There is no limit to the number of entries any individual can make, however all entries must be on an official entry form; photocopies are not acceptable.
3. Entries should be sent to:
   Protek Modem Competition,
   Amstrad User Magazine,
   169 Kings Road,
   Brentwood,
   Essex.
   CM14 4EF
4. No correspondence can be entered into regarding the competition. Entries cannot be returned.
5. The judges' decision is final. No employees of Amstrad, Amsoft, or Amstrad User, nor their relatives may enter.

A note on competitions

In this issue of Amstrad User there are three competitions open to all readers, plus the software competition which is only open to User Club members. If you want to enter the three 'open' competitions, you can put all the entry forms in the same envelope (mark it 'Competitions' instead of 'Protek Modem competition'). However, only these three competition entry forms may be sent together. If you wish to write to the magazine, or enter the software competition, then please use a separate envelope.

Official Competition Entry Form

AMSTRAD CPC464 USER

Name ....

Address ....

....

....

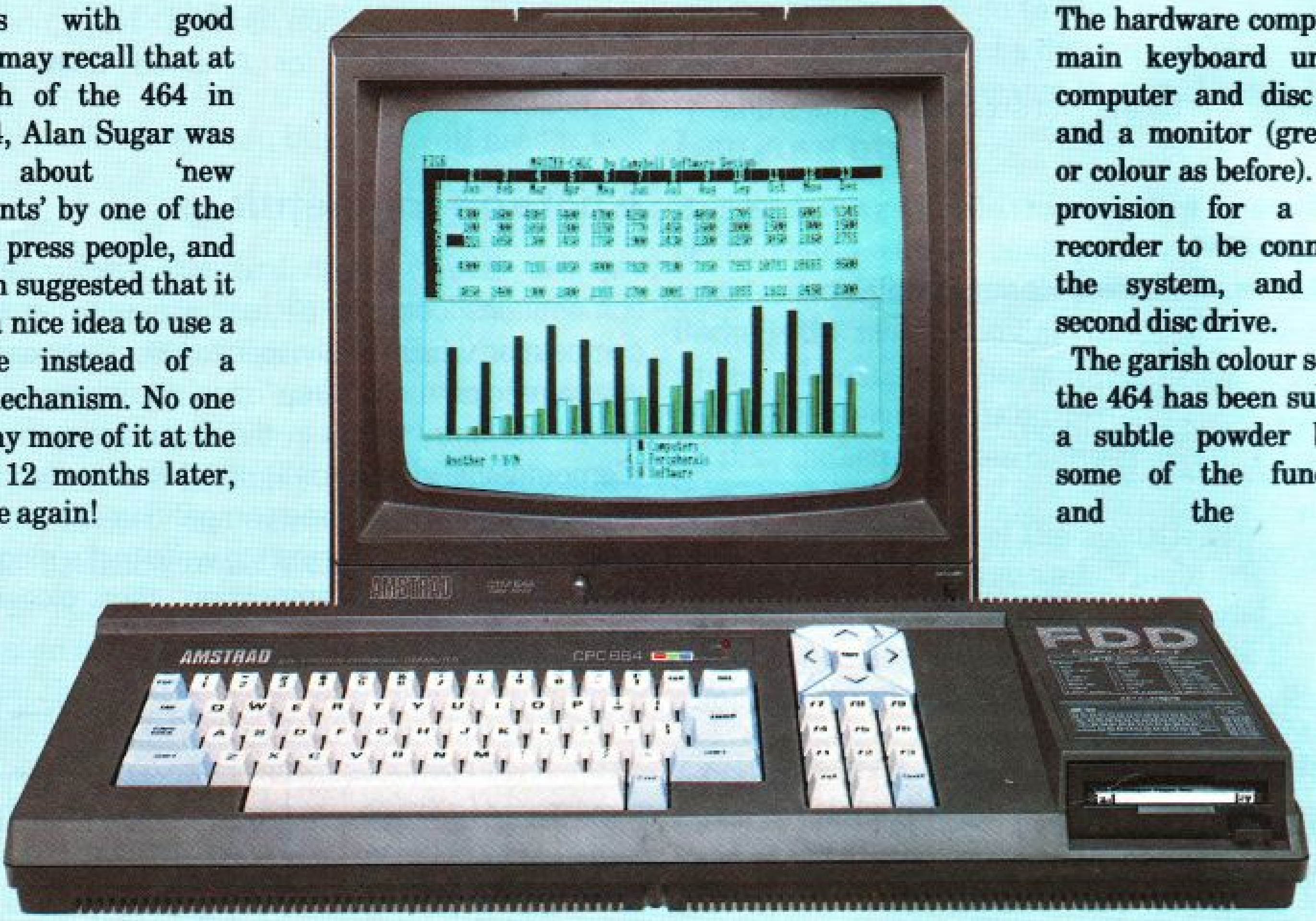
Number of words

W	E	N	D	P	A	A	U	T	O
I	D	W	A	R	P	E	R	S	O
N	I	A	T	Z	A	O	T	F	R
D	T	W	A	O	R	S	E	N	I
O	X	A	F	N	E	W	T	E	G
W	R	I	T	E	N	I	N	P	I
M	I	T	T	F	E	D	U	N	N
S	X	S	A	C	A	T	A	T	P
H	I	R	Z	Q	U	H	V	P	U
H	I	M	E	M	A	S	N	U	T

The CPC664

Arnold number two? Not quite, but rather more than a 464 with a disc glued in place of the tape drive. Ivor Spital unmasks a bit of a wolf in sheep's clothing.

'We don't want to make a big thing of this product' said Amstrad's Chairman Alan Sugar. He went on to hint darkly that the excitement and the big guns should be saved for much later in the year since the 664 was merely a logical consolidation of the 464 and the DDI1.



Observers with good memories may recall that at the launch of the 464 in April 1984, Alan Sugar was asked about 'new developments' by one of the assembled press people, and it was then suggested that it might be a nice idea to use a disc drive instead of a cassette mechanism. No one thought any more of it at the time, but 12 months later, here we are again!

This time though, the product is virtually in the shops, and almost certainly will be available during the currency of this issue. In fact, the speed of the CPC664's arrival causes us a problem that can only be resolved by changing the title of the magazine to 'Amstrad Computer User' with effect from the next issue.

The 664 also highlights another of Alan Sugar's observations at the original launch: only an experienced consumer electronics company has the discipline and the resources to react swiftly in the introduction of new products. Someone else took the best part of three years to think about putting a half decent keyboard on a computer that hitherto sported a rubber floormat where a keyboard should go!

And finally, the CPC664 has broken another barrier on price. A complete CPM80 micro system for well under £400. Despite all the price cutting that went on in early 1985, the 664 with its complete system approach of computer, disc and monitor still manages to provide a very well baited trap for the odd £350 burning a hole in the pocket of a would-be micro owner. The incorporation of CP/M has guaranteed that the machine will have to be taken seriously from day one.

Is the CPC664 just an amalgamation of CPC464 and disc - or does it conceal some other features? Read on.

The hardware comprises the main keyboard unit with computer and disc system, and a monitor (green-mono or colour as before). There is provision for a cassette recorder to be connected to the system, and also a second disc drive.

The garish colour scheme of the 464 has been subdued to a subtle powder blue for some of the functions - and the function keys are rather less reticent about declaring themselves with the letter 'f' preceding the numbers on the numeric keypad.

The cursor key cluster has overtones of MSX - but we won't hold that against it. The keytop shape has evolved into a stepped arrangement of slightly dished keys; a dangerous move perhaps in view of the universal acclaim that the 464 keyboard managed to achieve, but the 664

manages to carry it off without mishap. In fact, the new membrane construction and rather more modern styling all round is certainly no worse, and rather better in the view of those canvassed for an opinion.

Heritage

The 664 looks a lot like the 464; the same overall long slim shape, and the same basic dark grey cabinet. The main body of keys are a professional looking light grey, while the non-printing keys, ENTER, SHIFT, etc, are light blue. I must say that I didn't particularly like the blue at first, but it is growing on me. The disc drive is taller than the cassette unit it replaces and this is taken care of by a ridge which runs along the whole length of the back of the machine.



The new look CPC664

The use of a membrane keyboard in the 664 has resulted in the keys seeming to have a positive action yet requiring a light touch, and the effect is further enhanced by the keys being 'stepped' in height between adjacent rows.

Like the 464, the whole system is powered by one mains lead to the monitor. The monitor itself then supplies the power to the keyboard unit and the disc drive (there's an extra cable from the keyboard to the monitor to collect the 12V supply required by the disc drive unit). This means that the new monitor has an extra socket,marked 12V.

One area in which Amstrad has heeded its critics regards the printed inlay panel to the right of the numeric keypad. On the 464, this panel contains fairly worthless information on what part of the system connects to what; the 664 inlay contains a list of the 27 available colours together with their reference numbers, and a diagram illustrating the various key numbers -the times I've thumbed through my 464 user guide for this information.... Well done Amstrad.

I've been playing with a 664 for about a month now, and it's a pretty impressive machine. If the 464 was received enthusiastically as a complete machine without any (perceptible) rough edges, the 664 is assured of an equally enthusiastic reception since although most of improvements are only detail refinements, they add up to a very professionally designed and presented package. As far as the Z80 and 64K RAM package is concerned, 1985 is a year on from the CPC464 launch, and a year in which much is promised.

However, a bird in the hand is worth two on the press release as QL fanciers discovered to their dismay, and in this sense, the CPC664 is certainly tried, tested and supported.


All the plugs and sockets you'd expect

Going for a spin

The major feature is of course that it includes a disc system instead of the 'datacorder' built into the 464. After a year of using cassettes, it was such a pleasure to enjoy the speed and convenience of a built-in disc drive; programs are loaded in a fraction of the time a cassette takes, and cataloguing is instant. Like the DDI1 add-on for the 464, the disc drive in the computer uses 3 inch compact floppy discs. Both sides of a disc can be used, each side containing up to 169K of formatted space with CP/M system tracks attached.

The 664 supplies Digital Research's ubiquitous CP/M operating system to complement the AMSDOS BASIC disc handling extensions. The Dr. Logo programming language is also bundled free as part of the package, and as with the 464, you can choose from the CTM644 colour monitor or the GT65 green monitor. Again there is also a modulator/power supply available (MP2) so that you can use the computer with a domestic TV, if you really must.

The advent of the earlier DDI1 disc drive for the 464 means that there is already a growing number of software titles on disc that will be immediately available and ready to run on the 664. The cassette user is not abandoned however; there is a socket marked TAPE into which you can connect any standard cassette recorder and load and save onto tape just like a 464. Amsoft already stock this lead as part number CL-1.



The disc drive fits snugly

The vast majority of cassette software for the 464 is upwards compatible to the 664. It is only in cases where software writers have taken matters into their own hands and wilfully disregarded the advice offered in the firmware manual (and/or have used the area of memory now occupied by the disc operating system) that 464 programs won't run properly on the 664. Programs that use the firmware and OS legally can generally be tweaked to fit; those that don't, present more serious problems.

A second disc drive (drive B:) can be added using the existing model FD1 with an appropriate lead. This lead too is available from Amsoft, part number DI-2.

Fill 'er up!

There are several new BASIC commands on the 664, and programs using these will obviously not be transportable down to the 464. Likewise, 464 programs which accidentally use these new keywords as variable-names will need some editing to run on the 664.

One of the most exciting and welcome of the new commands is FILL. This allows you to fill an area of screen with a given colour, from the graphics cursor position, to the drawn boundaries (which may be invisible) or edge of screen. The command takes an ink number as its parameter, so you are able to change the colour of a filled area afterwards by re-defining the ink.

Another new graphics command is MASK. This enables you to specify a template when drawing lines. The provision of this command means that you can now draw all manner of dotted and dashed lines, and if a line continues round a corner, the template can be made to continue with it. Two further new commands, GRAPHICS PEN and GRAPHICS PAPER enable you to set the ink for drawn graphics (pen) and the area behind the drawn graphics (paper) independently of the text ink. Specifying the GRAPHICS PAPER lets you select the colour of the un-drawn areas of dotted lines. The GRAPHICS PEN command also has a parameter that lets you specify whether the background is to be transparent or opaque.

The command FRAME is included, which allows you to synchronise moving graphics with the display frame scanning frequency. This results in the smoother movement of graphics on the screen. This feature was available on the 464 through a firmware call (&BD19), and programs using this, and indeed all documented 464 firmware calls, will be honoured by the 664.

The existing graphics commands DRAW, DRAWR, PLOT, PLOTR, MOVE, and MOVER have been enhanced whereby a parameter can be specified that sets the graphics ink mode. Setting it to XOR, AND, OR, or normal mode determines how drawn graphics will interact with those already on the screen.

Using the XOR graphics ink mode in conjunction with a MASK command for instance, enables you to draw a multicoloured line where every pixel in each group of eight pixels is a different colour to its neighbour. In addition to this feature, the MOVE and MOVER commands have been further improved by allowing you to set the ink colour of the next point to be plotted/drawn.

Some new text commands have also been incorporated on the 664.

The command COPYCHR$ allows you to copy a character from an area of the screen into memory for processing; this is particularly useful for producing screen editing utility programs in BASIC. Another boon to the would-be word processor writer is the CURSOR command. This enables you switch the cursor on when it would normally be off (such as in INKEY$ commands), and switch it off when it would normally be on (such as in INPUT commands). There is also the option to clear the keyboard buffer by the new command CLEAR INPUT.

One very useful enhancement to 464 BASIC, is the 664 implementation of the AUTO command. Like the 464, the command will automatically generate line numbers for program entry, but now, when BASIC comes upon an already occupied line, it displays the line together with the cursor for editing. If and when you've edited the line, you may press ENTER and then go onto the next line, and of course enter new instructions on empty lines. This provides a quick means of continuous editing.

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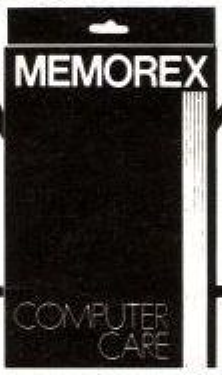
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A few other new commands worth mentioning are ON BREAK CONT, DEC$, and DERR. ON BREAK CONT allows you to make a program 'break-proof' so that it continues uninterrupted when the ESCape key is pressed. DEC$ produces a number in decimal string form, using any one of a wide number of format templates. Finally, DERR is an aid to disc error processing, returning values which can be used to take action as a result of differing disc errors such as 'filename already exists', 'disc space full', etc. The disc handling has been tidied up quite a bit, and you can now reference a file name directly, without having to assign it to a string first.

A number of external commands have also been provided which augment the various disc functions. CPC464/DDI1 users will be accustomed to these commands as they are available on the 464 when the disc interface is plugged in. The commands |A and |B direct reading/writing to the disc in drive A or B, |TAPE and |DISC direct operation to cassette or disc, |ERA and |REN erase and rename disc files, and |CPM calls up the CP/M operating system. There are a few variations on the above commands, and a couple more commands such as |DIR and |USER which display the disc directory (in CP/M style) and select a separate user area of the disc. The normal BASIC file handling commands such as LOAD, SAVE, CAT etc, all default to disc unless ‡TAPE is selected.

Manual labouring

One area in which the 664 scores heavily over the 464 is that of documentation. The users' guide is nearly twice the size of its predecessor, and in particular, delves much deeper into sound and graphics. Chastened by criticism from some quarters about the 464 book, Amstrad have made an attempt to cram as much as they can into this one. As before, it starts with a foundation course that even the most unknowledgeable beginner should be able to cope with.

Then comes a short section on how to turn some of these snippets of information into a program, taking the reader step by step through the program's evolution. Then follows a chapter which documents all the BASIC keywords, and illustrates with the aid of examples how statements containing the keywords are formally constructed. The next three chapters look at the disc drive side of things and provide an introduction to CP/M and AMSDOS (AMStrad Disc Operating System), along with the Dr. Logo programming language. This section only scrapes the surface of this fascinating language, so it is hoped that Boris Allen's Guide to Logo reaches the shelves soon.

Reference information is then provided in the next chapter which includes control codes, key and joystick codes, error messages, pin-out/socket connection details, printer configuration, memory map etc. The final main chapter starts with a general look at computers and computing principles, then goes on to further explain some of the more intricate aspects of the 664 in greater detail. Lastly, in addition to a glossary and thorough index, six fully fledged games programs are listed to give the new owner a start in life. All in all, you couldn't ask for more in a users' guide. Lets hope that Amsoft decide to sell the new manual on its own.

Software

Well, this is really where the 664 has the drop on the opposition. The very sound original specification and design of the CPC464 means that virtually all of its programs run on the CPC664. There are a small number of early programs that overwrite the top of store where the disc variables are located - but not enough to bother about.

The 664 ROM has been quite extensively revised, so all those software authors who in the past have wondered why Amsoft and Amstrad were so insistent about the observation of the rules set out in Locomotive Software's firmware manuals (Soft158 and Soft158A (disc)) now know. BASIC and machine code programs that obey the rules of the indirection system run on both machines, despite the additions to, and relocations of, the routines in the 664 ROM.

The CPC664 firmware and BASIC manuals are being revised at the present moment and may just about appear alongside the machines in May. You may rest assured that these will maintain the high standards of precision and presentation established for 464 documentation.



Plenty of sofware is available



A flying start

The 664 was born with a silver spoon in its mouth. With 'serious' programs like AMSWORD, Masterfile, DEVPAC, Screen Designer, Entrepreneur etc., already available under AMSDOS -and a growing number of custom CP/M installations of software like Brainstorm, MicroScript, MicroPen, and Quest's ABC complete business management system, the 664 does not have to battle uphill to convince software houses to hitch their wagons behind.

More crucially, owners don't have to go through the all too familiar phase of having their legs pulled that a 'rag-bag' of painfully bad BASIC games and utilities constitute 'an extensive range of software' while some real software is being written!

The system disc supplied free with the 664 contains all the usual CP/M 2.2 utilities and a slick update of the original 'Welcome' program supplied with the CPC464. On the reverse side you'll find Dr Logo - and whilst you'll need to buy a more extensive book on the subject to explore Logo properly, this piece of gratis software should in no way be dismissed as a throw away.

Dr Logo costs plenty to buy when it's not bundled, and maybe Digital Research and Amstrad have underplayed just what a remarkably good deal all this represents.

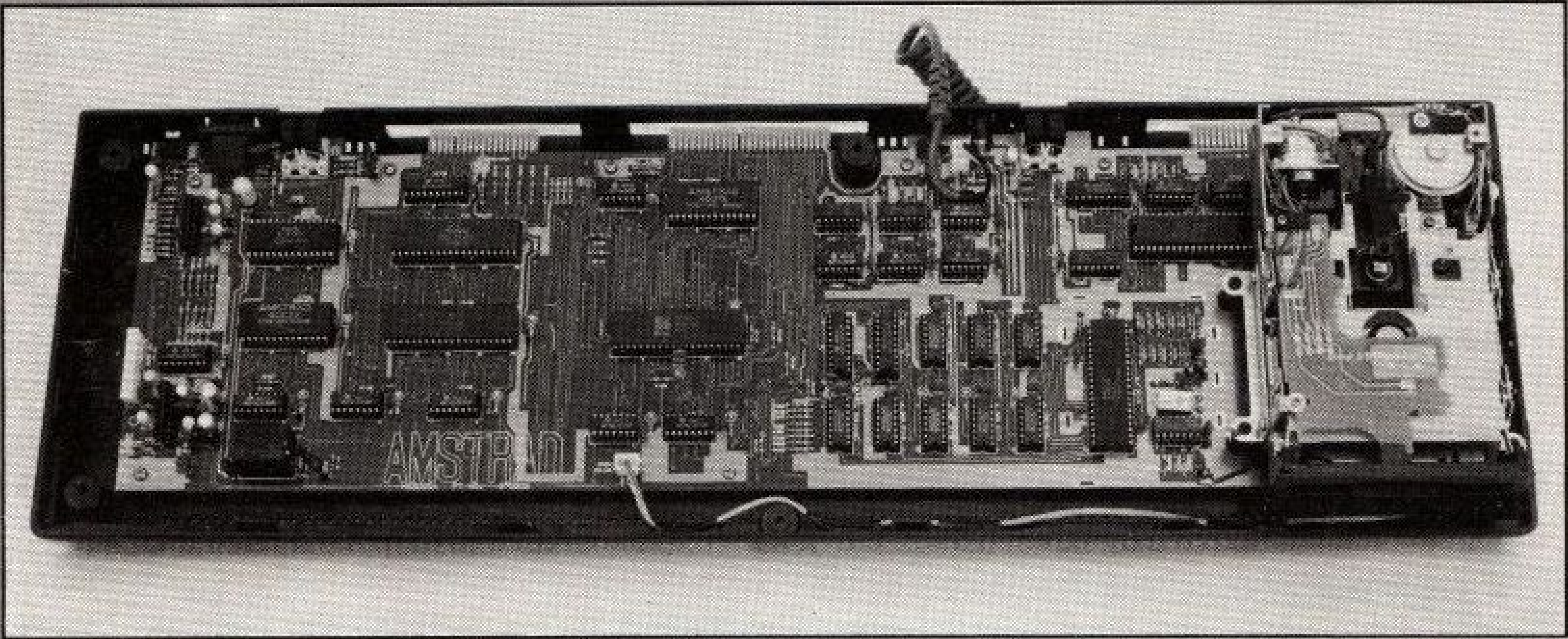
Conclusions

If the CPC464 is good (and most agree that it is!) then the CPC664 is on safe ground. It's a 464 with a built in disc and some extra wheezes in the BASIC, which has crammed in a few extra features that a year's squeezing of the ROM has found room for.

The CPC664 does not replace the 464 -it manages to find a gap in the market as not only the lowest cost disc machine, but the lowest cost CP/M 2.2 machine of all time.

Gripes? It would have been nice to see the control key re-sited to a more conventional position at the left of the keyboard, and it's a shame that pressing CTRL together with the small ENTER key does not execute a load command from disc - it gives a 'Bad Command' instead (unless | TAPE has been specified first).

Good points? The price and the convenience. At about £340 for the green screen system and £450ish for the colour set-up, it provides unbeatable value for money. The new keyboard is a plus point and the new manual is head and shoulders above that sold with the 464. The new 1.1 BASIC ROM is slightly faster and neater, but still compatible. The CPC664 is a well executed, logical step forward.



The insides are well laid out and uncluttered.

Computer Mega-Prize!



Win a CPC664

The Amstrad CPC664 is a truly remarkable computer, and Amstrad User has been lucky enough to have been promised one of the very first '664s as a competition prize.

How to win:

How carefully have you read this magazine? In the grid below are eight phrases which appear elsewhere in this issue. All you have to do is find which page the text has come from and write the answer in the appropriate box. When you have found all the page numbers add them up and write them in the box at the bottom.

Rules:

1. The winner will be the first correct entry drawn on May 31st 1985.
2. There is no limit to the number of entries any individual can make, however all entries must be on an official entry form; photocopies are not acceptable.
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   Brentwood,
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   CM14 4EF
4. No correspondence can be entered into regarding the competition. Entries cannot be returned.
5. The judges' decision is final. No employees of Amstrad, Amsoft, or Amstrad User, nor their relatives may enter.

A note on competitions

In this issue of Amstrad User there are three competitions open to all readers, plus the software competition which is only open to User Club members. If you want to enter the three 'open' competitions, you can put all the entry forms in the same envelope (mark it 'Competitions' instead of 'CPC664 competition'). However, only these three competition entry forms may be sent together. If you wish to write to the magazine, or enter the software competition, then please use a separate envelope.

Competition text:

		Page
1.	Look out for the novel horrors	
2.	Behind an elegant Edwardian door	
3.	Daily updates on the bugs in the QL	
4.	Drop the bird	
5.	Overtones of MSX	
6.	Amstrad owners are being spoiled	
7.	This may well look Double-Dutch	
8.	Are you any good at soldering?	

Total of page numbers

Name ....

Address ....

....

Oops!

OK, so we're all human, and just to prove it, we included several mistakes in back issues of 464 User.

In the Oct/Nov issue, the KINGDOMS program contained a couple. The first was in line 340, where, due to a 'hiccup' in our typesetting machine, an end-of-line was missed, so that line 340 became a continuation of line 330. It should have read:

```
330 CLS
340 INK 0,1:INK 1,24 ....
```

The same happened in lines 1370 and 1380, and they should read:

```
1370 LOCATE 1,10
1380 s=INT(b*c*a/1E+09)
```

Lines 980, 1000 and 1010 all lost division symbols and should have been:

```
980 aa=cp/10:bb=cq/6
1000 ap=aa*100/a: .....
1010 IF bb/b<0.7 THEN af=1
```

BOMBER only contained one error, this was of the joined line variety, lines 330 and 340 should read:

```
330 IF bomb>0 THEN GOTO 530
340 gx=((x+1.5)*32): .....
```

D.I.Y. Typewriter's alternative line 60 (for green monitors) should have read:

```
60 MODE 2:BORDER 0:INK 0,0:INK 1,26:
    PAPER 0:PEN 1:GOSUB 1340
```

A different method of transferring programs to the typesetting machine meant that the Jan/Feb issue did not contain any errors in the listings. A lot of people have had SYNTAX ERRORs in UP THE BEANSTALK, but unfortunately this was due to their own typing errors; the listing as presented is correct. However SYNTAX ERROR may indicate a particular line, when in fact, the error is in one of the previous DATA lines. It's a good idea to check that commas and full stops have not been exchanged.

The gremlins reared their ugly heads again for the March issue. The example music program by Cliff Lawson at the end of the INTRO TO MUSIC article contained an error in line 440. The 'XXXX' should be one up-arrow:

```
440 period=base/(2↑octave)
```

TRENCH ATTACK had an attack of the up-arrow gremlins too. In line 440 an 'm' was printed in error, it should be:

```
440 j=0:FOR i=0 TO 23:j=j+0.2:x=2↑j: .....
```

Similarly in line 1100:

```
1100 IF SQR((xp-xm)↑2+(ym-yp)↑2)>s*2 THEN RETURN
```

There is nothing wrong with any of the listings in the SCREEN DUMP utility, however, it has been pointed out that the program relies on the ORIGIN being set to 0,0. This could easily be remedied by including a CALL to GRA GET ORIGIN (#BBCC) at the start, then PUSHing DE and HL onto the stack. The routine would then end with two POPs and a CALL to GRA SET ORIGIN (·BBC9). For those who don't have DEVPAC or some other assembler, a modified hex dump is available by sending an SAE to our Technical Enquiries department.

The ELECTRIC EDDY program in the same issue does not have enough words in the DATA statements at the end. Two more words must be added in a DATA statement at line 1890. The words used are left to your imagination, but the line must have the following format:

```
1890 DATA rhyme,reason
```

On to the April issue, in the article about music, there are the seemingly almost inevitable up-arrow problems. One of the example program lines should be:

```
frequency=440*(2↑(octave+((n-10)/12)))
```

Similarly in the short program:

```
30 frequency = 440*(2↑(0+((a(y)-10)/12)))
40 pitch=ROUND(125000/frequency)
```

In the MISSILE ATTACK program three underlines in quotes in line 1050 should in fact be up-arrows:

```
1050 ..... :PRINT son$;"↑↑↑";soff$;
```

Our biggest faux pas to date, hit the MONSTERS FINAL HOUR. Lines 290 to 380 are missing. We don't have enough room to print them here, but Simon, our editor, will personally put a correction sheet into a stamped addressed envelope if you would like to know what fills this gaping chasm. (Please mark your envelope 'Missing monsters' - Ed.)

Software Reviews



Game of the month

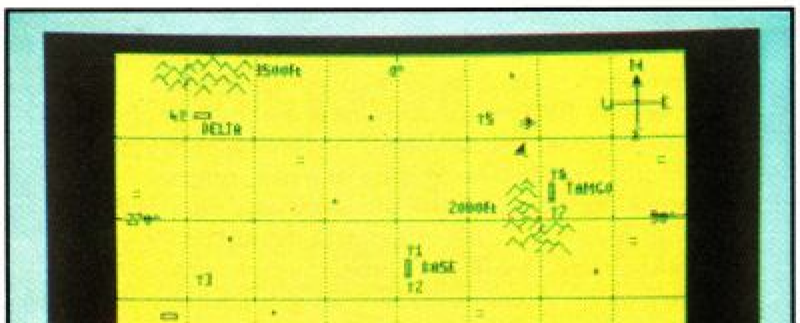
Fighter Pilot

Digital Integration's Fighter Pilot still rates as one of the best aircraft simulations on the Spectrum, and like most Spectrum conversions, it gains stature on the transfer to the Amstrad machine.

The aircraft itself is a McDonald Douglas F-15 'Eagle': a purposeful warplane if ever there was, with a performance that rates it as a Ferrarri of the skies. In fact, since the thing climbs happily at 90 degrees (i.e. straight up) and has a top speed of over 1500 mph, it's easy to get out of trouble by calling on the performance. It's also a very good thing that your ears don't pop and you don't black out under excessive G forces.

There are 6 program options that allow you to start gently with landing, flying, and air-to-air-combat practice. The real air-to-air-combat mode is definitely for heroes only, since the simulation becomes a full scale wargame requiring you to defend a number of bases by finding and shooting the enemy (which looks like a Mirage fighter/bomber) before he bombs the ground targets.

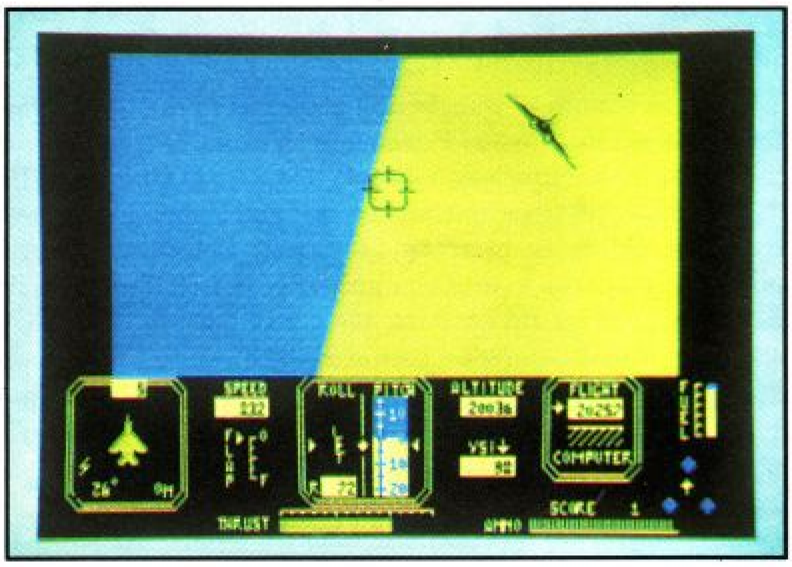
You can also try a 'blind landing' on instruments only (it IS possible), and you can add a little spice with crosswinds and turbulence.



Add to this, a selection of game levels from novice to ace, and this program could provide an alternative to basic flying practice and save the taxpayer the odd £100 million.

The 3D effects are excellent. If you approach the enemy from above or below, you will get a correctly drawn perspective that is completely credible. Admittedly most modern simulators offer this level of sophistication, but it's still quite exciting to see this on the first full scale simulation for the 464.

The runways are similarly correctly projected, but it is very difficult to land unless you do things properly and in an orderly manner. Flaps, undercarriage, speed, rate of descent, alignment; there's nearly no chance of landing in one piece if you come zooming in and expect to 'plonk' it down.



It all adds up to give the would-be superhero a healthy respect for the business of flying.

Your F15 comes complete with a detailed map that tracks your position and that of the enemy across a terrain with four air strips and the occasional mountain. There's an instrument landing system that works very well, which doubles up as a combat computer to inform the pilot of the enemy's height. There is also a radar/compass system that indicates the relative heading of either the enemy or the selected runway (there are various radio beacons placed around the four runways).

Speed, thrust, altitude and rate of climb/descent are also displayed. Undercarriage, flap, fuel, and ammunition status round off the control displays.

First 'Sorcery' and now 'Fighter Pilot'. Amstrad owners are being spoiled.

£7.95 for this program is a steal. Star ratings? Straight 5's.

Roland in Space

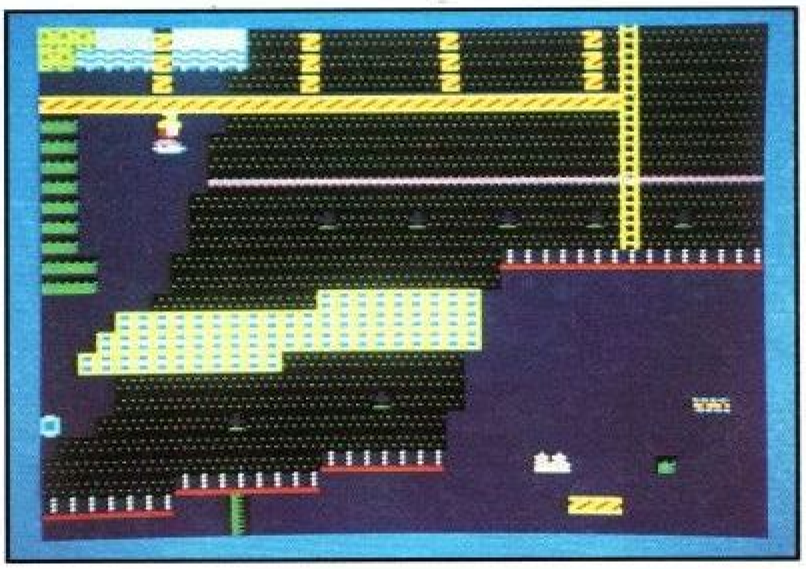
The second multi-screen mega-game to come from Gem Software exclusively for the Amstrad. If you liked 'Roland In Time', then this is a must for you. All the features which we all loved so much have been included plus many more. Perhaps the most important feature to note is the inclusion of speech -although this can only be heard if an Amstrad or DK'Tronics speech synthesiser is attached. Don't worry though if you haven't got a speech synthesiser to hand; the excellent sound track can still be relished by the rest of us! After a while though, you might be pleased to know that this can be turned off by pressing the large [ENTER] key.

The plot couldn't be simpler, Roland our intrepid hero is stranded yet again, but this time it is more serious; he is trapped in 'space'... with the daunting task of building a super-weapon. There are 7 planets to explore in all and only 10 lives in which to do it. The objective is to explore and collect as many components of the super-weapon (there are 158 components in all!) as is possible within the number of lives allowed. Simple eh?... until you realise that an indestructable helicopter is coming straight for you, and it is not possible to get out of the way! Look out for some of the novel horrors that await - like the flying apple (one of my favourites).



For those of you who are expert at playing 'Roland In Time' don't despair at the fact that there are only 7 planets to explore, since each planet can be 'scrolled' at will. This makes playing far more exciting and unpredictable because the 'unknown' really IS unknown, unless of course you become adept at moving Roland and scrolling the screen simultaneously. The actual size of each planet is immense and at first it is very easy to lose track of Roland's time machine (a telephone box, for those who don't know), making proceeding to another planet very difficult and frustrating when the ever present nasties seem to gang up on you.

The graphics are colourful and clear (being one of Gem's special trade marks). For those lucky enough to be able to attach a speech synthesiser listen for Roland's cries for 'Help' and his reassuring words of 'Don't lose your head' and 'Stay cool'. There are a whole multitude of humourous phrases to listen for, including one miscellaneous phrase of 'Hello mum'.....



As with 'Roland In Time' there are a number of hidden escalators and stairways, which can lead to either safe retrieval of an otherwise impossible crystal or more probably an untimely death. It is only with practice and perseverance that success is achieved, but should you hesitate at a particularly tricky moment, Roland will turn his back until some instruction is given!

This game must surely join the rest of the Amstrad classics, and is an absolute must for all who are Roland In Time fanatics.

AUTHOR:	AMSOFT/GEM Software
FORMAT:	Cassette
PRICE:	£8.95
GRAPHICS:	*****
PLAYABILITY:	****
ADDICTIVENESS:	****
OVERALL:	****

Defend or Die.

It must be quite difficult to write a home version of an arcade game; so many of the games players will have seen the arcade original, that the task of copying has to be performed with care.

Defend or Die is quite clearly a *Defender* clone with the name changed to protect the guilty. However, Alligata should be safe from an Atari lawsuit, if Acornsoft can get away with 'Planetoids' and Alligata with 'Guardian' then Defend or Die should be OK.

When Defender was first launched as a coin - operated machine it was slated by the industry for

being too complex and the author, Egune Jarvis, was accused of having too many controls. However it sold well and must rival such video greats as Pac-man and Space Invaders in terms of takings.

The reason for this is that Defender is the kind of game which you play by instinct. Your eyes have to be everywhere to control the up, down, thrust, fire, hyperspace, reverse and smart bomb, making split second decisions over which alien to shoot or if a situation is survivable. Watching the score to see if you can afford to waste a smart bomb or if you should commit suicide to save the planet. Defender is complicated but it is fun to play. When you have tired of ladders and platforms games or eating dots you will probably return to this kind of game.



With such a pedigree it is hard for 'Defend or Die' to be a perfect clone: for starters, the original has 256 colours. However the spirit of the game is more important. The tactics are what count.

Perhaps the greatest discrepency is the behaviour of the pods. These are harmless little aliens which once shot release a mass of very nasty red baddies called swarmers. The Defend or Die pods are opened by a smart bomb but the swarmers are not destroyed as they should be. This reduces the need to save smart bombs until the beginning of the next sheet. If you open pods one at a time the swarmers make a bee-line for you. This makes them too easy to pick off. These may be signs that the programmer has not spent long enough playing Defender.

There are several oddities in the program, some might call them bugs. If you hyperspace whilst firing, the program seems to lose track of the ships position and the shots wrap around the screen. It is also possible to fly off one end of the screen and reappear on the other side. A feat certainly not possible in Defender. Your shots stop as soon as they hit something, be it an alien, a bullet or a bonus score. This can make it dangerous for you to fly low shooting like a mad thing, an essential Defender tactic. It is necessary for you to be a short distance away from the alien before you can blow it up. If you are too close you can blast to your heart's content and the alien will stand and take it.

None of these 'bugs' detract from the playability of the game, it is still a fine program. The scrolling is smooth, the sprites fast and the explosions magnificent. The sound is reasonable, even if it does cut out at unexpected times. Perhaps I have spent too much time reviewing Defender clones and have become too fussy. The best around is probably Alligata's Guardian for the Beeb. Given the CPC464's superior graphics and memory it is a shame that they could not top it. Defend or Die is both fun and addictive. I know I will return to it when I feel the need to blast something.

AUTHOR:	Alligata
FORMAT:	Cassette
PRICE:	£7.95
GRAPHICS:	***
PLAYABILITY:	*****
ADDICTIVENESS:	****
OVERALL:	****

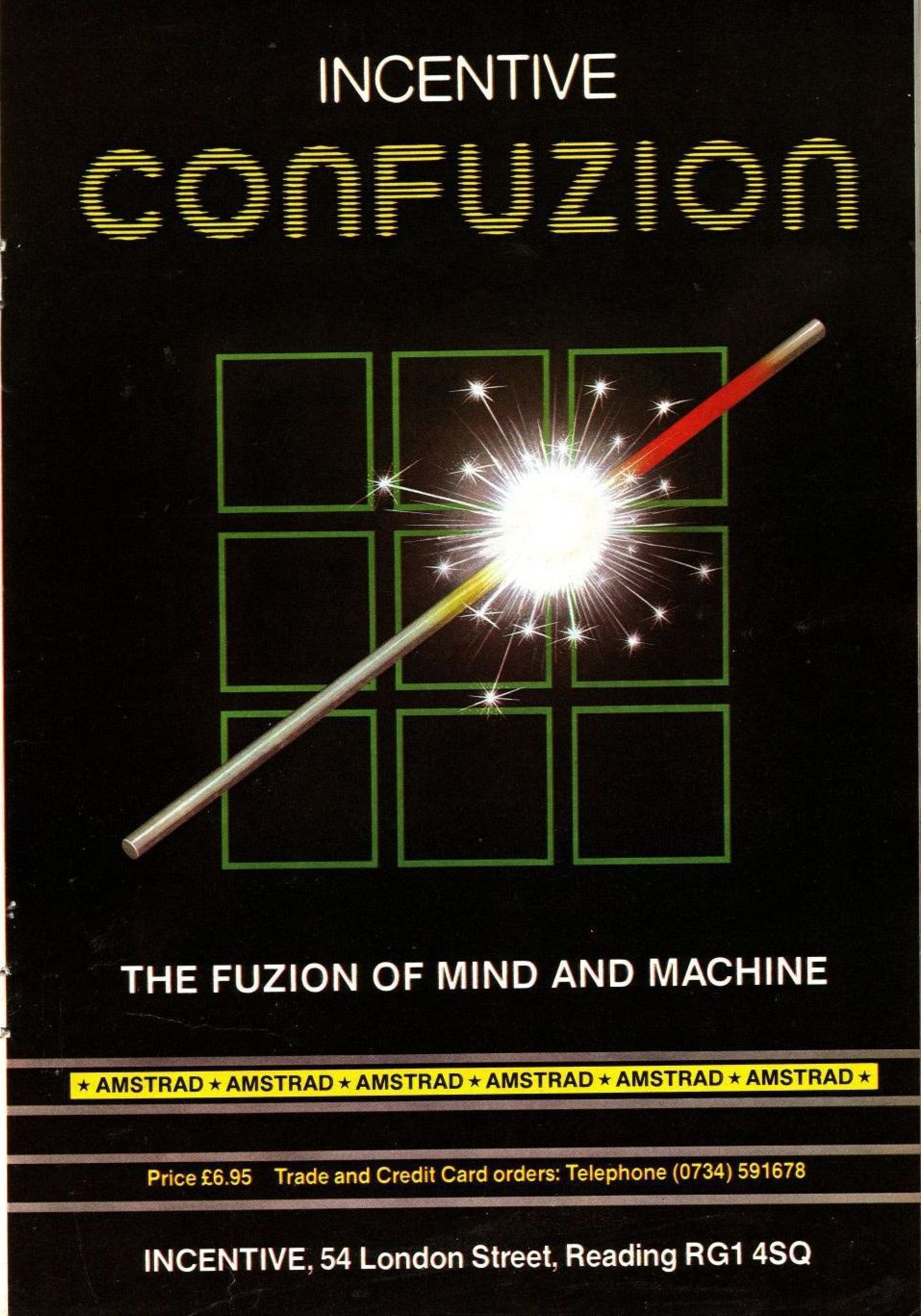
Dark Star

No talking bombs or space-hoppers in this one, but you will not have time to miss them. *'Want yer mouse?'* quizzes the first Hall of Fame entry. Too much of this all-action space combat simulation could leave you thinking this was a sensible thing to be asked.

The game loads almost continuously, with a colourful hi-res title page after 60 seconds, then an excellent set of game/sound/keyboard and joystick control options some 2.8 minutes later (all text with proportional spacing!). Beginners can choose to disarm the enemy while they learn to fly the ship, and nerve wracking stereo sound effects can be selectively silenced. The overall game difficulty may be altered from a level almost anyone could manage, to that possible only by those also driven at 4 MHz.

The point of the game - to liberate at least one planet from each sector of the regularly re-created universe - is hardly original, but that thought does not last long as you plunge headlong through the star-studded blackness of space, desperately fighting off alien craft, and dodging their spluttering, spinning fireballs. By all means fire back, but to refresh your energy banks, fly through the pulsating blue rectangles as they swoop towards you. Travel to adjacent sectors of the universe is achieved by diving through the rotating hyper-space windows. These inject your craft into colourful warp tunnels which snake their way into the new sector.

All this adds up to an experience somewhat like


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flying through thick snow, with added pin-wheels, followed by a 300 m.p.h. drive through the Dartford Tunnel during land slippage. This alone is enough to keep the best games-players hard at work whilst those looking on, having been treated to the best in 3-D perspective sight and sound, might well feel slightly ill.

Pressing on to the green planets, you will find a new vista of multi-coloured city lights sweeping below you from the horizon. Using the planet map you make your way towards the enemy installations, effectively portrayed in the wire-frame format, and there weave in and out (and over!) the battle scene demolishing the attacking towers with your armaments. Stricken buildings fall gracefully into the ground, whilst yet more spring into view. If your craft's energy is to be maintained, a sequence of coloured squares must be flown through as your attack proceeds; whilst the end of your run is marked by a clump of buildings. If you succeed in removing the central tower then the base is considered fallen, and you fly on to knock out any remaining bases on the planet. You are then free to return to normal space-flight, using the universe map to plan your next move.



The graphics and stereo sound in this program are spectacular and convincing; it is surprising how much can be achieved using coloured horizontal and vertical lines, plus a large number of dots! The whole action is fast, smooth, and well orchestrated, and anyone who found the combat sequences in 'Codename Mat' exciting, will enjoy this game tremendously, without feeling that they have two games the same.

It appears that this program is not sold by Amsoft, probably because they were unable to come up with the 10,000 marbles requested by its author, Simon Brattel (see Hall of Fame!). Why Simon should want these I cannot imagine, as he obviously has more than his fair share already - at least as far as programming is concerned. 'Dark Star' deserves considerable success on the 464 - a leader of space-fight simulations.

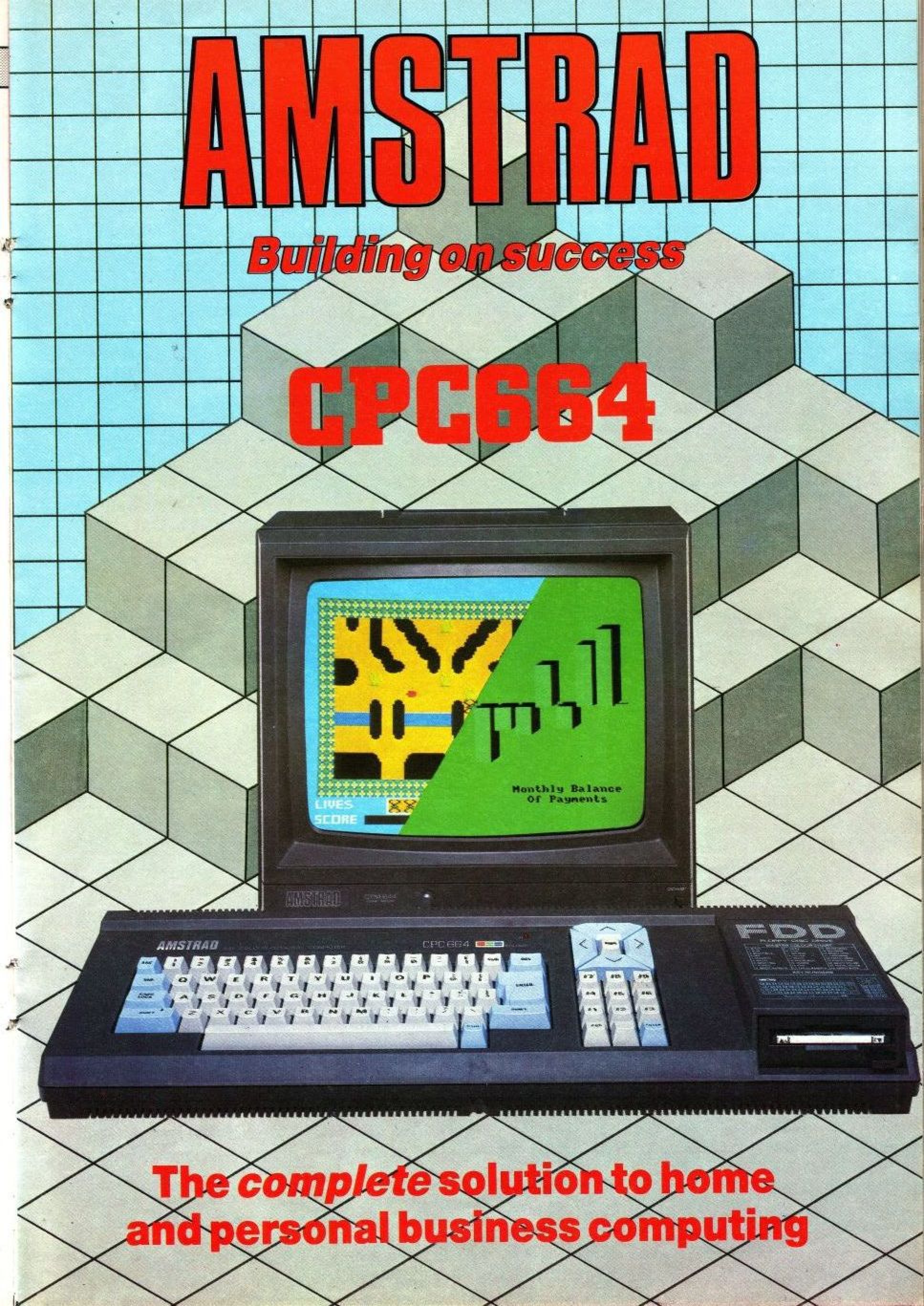
AUTHOR:	Design Design
FORMAT:	Cassette
PRICE:	£7.95
GRAPHICS:	****
PLAYABILITY:	*****
ADDICTIVENESS:	*****
OVERALL:	*****

The Quill

I've never really considered myself to be much of an adventure nut. The first mention of how you got past the snake by throwing a bird at it is usually guaranteed to send me off to sleep - however after a couple of evenings using Gilsoft's 'The Quill', I can begin to see the appeal of adventures. I think the reason that a lot of people are initially put off adventures is their inability to get anywhere in the quagmire of convoluted problems that the majority of commercially available adventures contain. Getting behind the scenes and being able to set your own simple problems, I think, is going to appeal to a lot more people. The idea that you may eventually create an adventure to equal any of those that you might buy is always an intriguing prospect, especially if that might include being able to sell it. The indications from the original Spectrum program are that this is a quite viable proposition.

A program that takes all the donkey work out of any low level programming task will always appeal to the thousands of people who can string together a couple of hundred lines of BASIC, but who would never think of attempting machine code. The Quill is just such a program. A program of this type is still no good if you need a degree in computing science to operate it, and the acid test of a program's ease of use is to give it to someone who knows very little about programming, and to see how far he/she gets; in this case, my mum was the guinea-pig. After just one evening's use she had grasped the majority of concepts necessary to produce a working product. Admittedly this was just the example six location adventure that is detailed in the manual, but as she pointed out; having seen exactly how this was constructed, it would be quite simple to adapt it to your own ideas, changing the messages and objects, and eventually expanding the range of locations and puzzles.

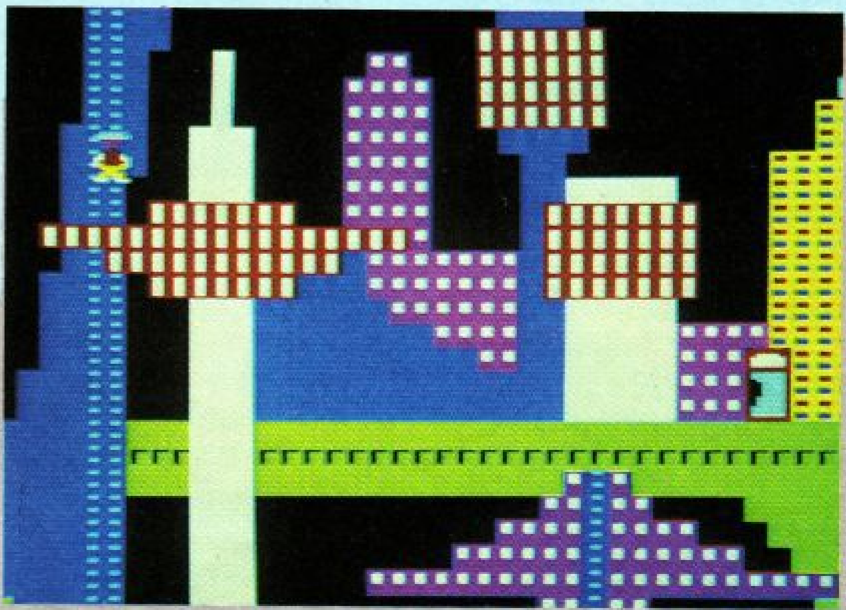
The adventure is built around a series of locations, each of which is given a number and a description supplied by you. It is then necessary to indicate how


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The CPC664 is much much more than just a sophisticated video games console. With high resolution graphics and an 80 column text display combined with the built-in disc drive and purpose designed companion screen systems, the CPC664 provides the user with everything required to "plug in and get going" with applications for all the family, ranging from arcade games to business and accounting.



Colourful

There are already over 100 entertaining and colourful games from Amsoft and independent vendors; and if you fancy your own programming skills, then the disc based development environment of the CPC664 is absolutely ideal.

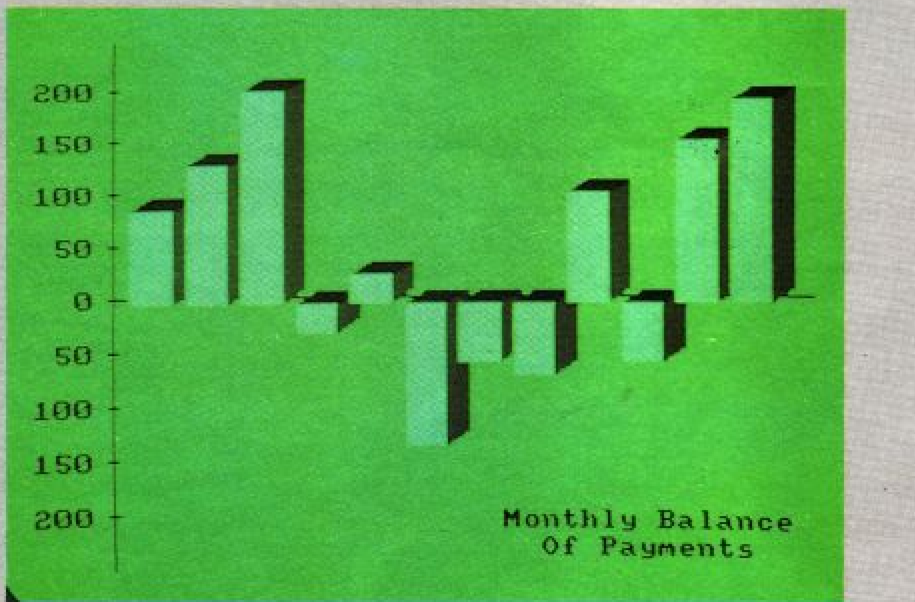
The CPC664 started life with an unfair advantage: all the disc-based and most of the cassette based software written for the CPC464 runs without modification of any kind on the CPC664. Arcade classics like Roland in Time, Codename Mat, Hunchback and Fighter Pilot are on the shelf just waiting to challenge and amuse CPC664 owners.

Businesslike

Digital Research's famous CP/M operating system keeps your CPC664 disc filing in order while programs like Microscript and the Amsoft Business Control system (dual disc systems) keep your business affairs in order.

The Amstrad CPC664 is the ideal computer for the small business; and what with things like rates, mortgages, HP, income tax, insurance etc., just about everyone can benefit from running their personal affairs with the aid of a low cost computer.

Give all your correspondence the professional touch. Plan your domestic budget, file names and addresses, organise your time more effectively and efficiently.





Versatile

The built-in ROM BASIC for the CPC664 is in the tradition of excellence established by the CPC464. Programs written using the CPC464 BASIC will run on the CPC664. Additional graphics features have been added - a high speed area colour fill, dotted line drawing - and some BASIC commands are now even more powerful than before.

As part of the CPC664 package, you will also receive Dr LOGO on disc - the world famous teaching and graphics language that introduces the concepts and ideas behind writing computer programs.

And like all the best computers, the CPC664 has fully supported expansion bus connectors for peripherals such as a standard Centronics interface printer, second disc drive, speech synthesiser etc.

Success breeds success

Incorporate a disc drive instead of a cassette, and the CPC464 is transformed into the ideal serious home and small business users' machine............



Amstrad's complete package includes computer, disc drive and monitor

Your choice of either green screen (GT65) or colour (CTM644) monitor

The CPC464 has already received widespread critical acclaim, and now the CPC664 combines the success of the CPC464 with the convenience of disc based operation...

★ Proven performance

"Not often is a machine as pleasant to review as the Amstrad CPC464. It is easy to set up and use, and the documentation is clear and complete. The screen display is rock steady and the cassette system works."
- Ian Stobie, Practical Computing, October 1984

★ Unequalled value

"Extremely good value for money" *- Micro Choice, Winter 84/85*

★ Broad support base

Over 200 software titles on sale for the system (not including CP/M). Over 15 books covering topics ranging from an Advanced User Guide to writing business software, arcade and adventure games.

★ Setting standards

"The Amstrad CPC464 is possibly the first home computer on which it is possible to edit programs using an 80 column display mode on the basic machine" *- Personal Computer News, November 1984*

Building on success



You'll soon want your CPC664 system to expand with peripherals such as printers, joysticks and other tempting add-ons. The CPC664 has external connectors for Centronics standard printers, second disc drives, standard joysticks etc.

Cassette Interface

If you've got an existing store of CPC464 programs and data on cassette, then you'll be pleased to know that the CPC664 comes complete with a built-in cassette interface to allow you to transfer from cassette onto disc (and vice versa). You'll need to use a standard cassette recorder in conjunction with the CPC664.



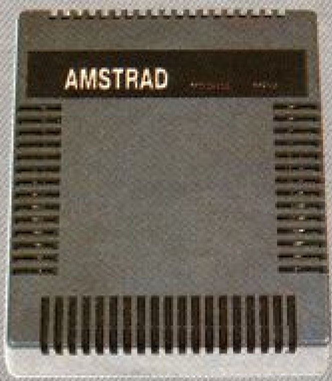
Printers

The Amstrad DMP-1 dot-matrix printer will provide you with hard-copy for listings and letters at a very low price - but the use of the Centronics standard printer interface means that you can also select sophisticated printers from the widest ranges of dot matrix, thermal transfer and daisywheel systems in the industry.



Joysticks

Amstrad's new JY-2 joystick features a fast and positive click action that puts you in complete control of anything from the Earth's defences to Roland's fearless travels. A socket built into the base of the joystick enables a second joystick to be connected to the computer for two player games where the option is available.



Colour TV Modulator

The MP-2 colour TV modulator and power supply contains all the electronics necessary to power the CPC664 and direct the display to a standard colour TV set. So if you have bought a green tube monitor system, and you want to take advantage of the 27 bright colours in arcade action games, then you need the MP-2.



Additional Disc Drive

Two drives are better than one - and it's simplicity itself to expand the CPC664 to add an extra FD-1 to double the on-line storage capacity of the CPC664.

Expansion facilities

The expansion connector at the rear of the CPC664 contains all the signals necessary to implement a wide range of add-on peripherals. Modems, light pens, speech synthesisers and serial interfaces are amongst products already in development by either Amstrad or independent vendors.

Make Your Business a Pleasure......

The versatility of the CPC664 coupled with the CP/M and AMSDOS disc operating systems opens the way to sophisticated business applications programs that will both teach you the fundamentals of organising your business effectively (Entrepreneur, Project Planner, Decision Maker etc.), and then provide you with the workhorse to put theory into practice.

GT65 Green Monitor, CPC664 Computer and Disc System



On the screen.....

Microspread (Soft 1012) is a multi-facility spreadsheet that provides a wide range of mathematical and statistical features for financial and numeric analysis of all types.

★ Word Processing

Microscript (SOFT 1010) is an easy to learn and use word processing program that incorporates a 16 digit calculator so that you can add up invoices and statements as you type them.

★ Database

Micropen (SOFT 1011) will file and index records into a database that's as large as the available space on the disc will permit. Micropen is ideal for mailing lists and standard letters, and uses a subset of Micropen to produce simple output forms and reports.

★ Integrated accounts

Amsoft's ABC series of Business Control programs could be the solution to many small firms' bookkeeping problems. It's a complete invoice, stock control and statement system that combines to provide a fully integrated set of accounts that can save you time and money. The ABC system requires the use of a dual disc system (one as the program disc, the other for data).

★ The CP/M storehouse.........

CP/M is the most widely recognised 8-bit disc operating standard, and while software written under CP/M must be transferred to the disc format of the CPC664 - this is a far less onerous task for the software author than completely re-writing his programs for a new standard altogether. So programs are based on tried and tested principles: particularly important where a serious business use is anticipated.

** Please note that these programs are not supplied with the computer system, but must be purchased separately.*

The Advantages of Disc Operation



First and foremost you will notice the speed of disc operation. It's up to fifty times faster than cassette when loading programs. Time is the one commodity you can never replace, so would you rather spend yours waiting to load a program, or using the computer?

Disc reliability is far better than with any of the various schemes for tape based storage. Not only is there greater integrity of data, you can very quickly check the contents of a disc to see that the programs are correctly saved. Backup copies of up to 179k of data can be made in a couple of minutes using the disc system - compare this with the 30 minutes or so it takes to backup this amount of information using cassette storage.

Access to individual files on the disc is far simpler and quicker. With a cassette you must wade through from one end of the tape to the other to find the program you want: and then only if you have remembered the name accurately! With a disc system, you can simply catalogue the contents in a couple of seconds and then go directly to the program you need.

The disc system of the CPC664 provides you with Digital Research's famous CP/M - the most widely used disc medium for 8-bit computer programmers using the Z80 microprocessor.

What all this adds up to is the graduation of home computing from a cassette based games medium to one where serious applications can be tackled with ease - without requiring add-ons. Amstrad supplies the complete package.

Disc based software can manage a far more diverse and versatile range of functions than can cassette software: parts of programs that are not required to be resident in RAM all the time can be called in from the disc as required (a technique known as overlaying). In this way, very large programs can run with occasional accesses to disc to supplement the working RAM storage area.

The data from programs may be 'windowed' onto disc. For example, a word processing program can create and edit a file that is far bigger than the available RAM space.

General features

The CPC664 is supplied with 64K RAM as standard, over 41K of which is actually available to the user in all screen display modes, thanks to the implementation of ROM overlay techniques. This substantial usable RAM gives an indication to the sophistication and complexities in programming that are possible.

Keyboard - A "real" 74 key keyboard with conventional 'qwerty' layout and largesize entry key. Cursor keys are sensibly positioned and a numeric/function keypad cluster is provided for convenient and fast entry of data.

Extended Character Set - A full 8-bit character set including symbols and graphics is accessible via the keyboard and using the CHR$(n) functions.

User Defined Keys - Up to 32 keys may be user defined on the CPC664, using strings up to 32 characters long.

Windows - The user can select up to eight text windows into which characters are written, and also a graphics window into which plotting may be performed.

Sound - The sound facilities of the CPC664 extend to 3 channels (voices) over 8 octaves. Each of the channels can be independently set for tone and amplitude and they appear as left, right and centre using the stereo extension jack socket. The sound level from the internal loudspeaker is variable and is produced as a mixed monaural output.

Printer Port - An industry standard 7-bit Centronics compatible parallel printer port is provided, using the 'Busy' signal line for performing handshake operations.

Expansion Support - Many hardware interfaces are available via jump blocks or indirections to provide software expansion facilities. Extensive documentation is available that describes the operating system and BASIC in detail.

Expansion ROMs - All ROMs occupy the top 16K of memory and there are facilities in the firmware to call up to 252 additional 16K add-on ROMs.

Software Features

The Locomotive BASIC first seen on the CPC464 has been upgraded with certain extra features for the CPC664. Compatibility has been retained with CPC464 BASIC.

The major new feature in the BASIC is the inclusion of a high speed area fill command, and the provision for drawing dotted lines in the various DRAW commands. COPYCHR$ allows the user to read back character values from the screen display. Certain features pertaining to disc operation are present by default, and there are important enhancements to disc error and break conditions.

Unique Real Time Control

The major new interrupt subroutine features of Locomotive BASIC are retained in the CPC664, with the unique syntax of AFTER and EVERY. Programs handling sound and graphics are particularly well served by these BASIC facilities which are implemented on Amstrad computers.

Screen Handling

The three screen modes of the CPC664 provide the ideal combinations of colour and clarity. 16 colours selected from a palette of 27 provide the ideal games medium in Mode 0 -160x200 pixel.

In Mode 1, 40 column text combines with 4 colours (from the palette of 27) to provide a clear presentation for educational and similar applications using a graphics resolution of 320x200 pixels.

Mode 2 combines 80 column text with any 2 colours from the palette of 27. The graphics resolution of 640x200 pixels is available for high definition diagrams, bar charts, pie charts etc. With 80 column text, it is possible to display the text during word processing in precisely the same way as it will appear on the paper when printed.

The CPC664 comes complete with a substantial User Guide that includes information for the novice and the experienced programmer. The comprehensive nature of this guide owes much to the experience gained in compiling the original CPC464 and Disc Drive documentaton.

BASIC KEYWORDS:

ABS, AFTER, AND, ASC, ATN, AUTO, BIN$, BORDER, CALL, CAT, CHAIN, CHR$, CINT, CLEAR, CLG, CLOSEIN, CLOSEOUT, CLS, CONT, COPYCHR$, COS, CREAL, CURSOR, DATA, DEC$, DEF, DEFINT, DEFREAL, DEFSTR, DEG, DELETE, DERR, DI, DIM, DRAW, DRAWR, EDIT, EI, ELSE, END, ENT, ENV, EOF, ERASE, ERL, ERR, ERROR, EVERY, EXP, FILL, FIX, FN, FOR, FRAME, FRE, GOSUB, GOTO, GRAPHICS, HEX$, HIMEM, IF, INK, INKEY, INKEY$, INP, INPUT, INSTR, INT, JOY, KEY, LEFT$, LEN, LET, LINE, LIST, LOAD, LOCATE, LOG, LOG10, LOWER$, MASK, MAX, MEMORY, MERGE, MID$, MIN, MOD, MODE, MOVE, MOVER, NEXT, NEW, NOT, ON, ON BREAK, ON ERROR GOTO Ø, ON SQ, OPENIN, OPENOUT, OR, ORIGIN, OUT, PAPER, PEEK, PEN, PI, PLOT, PLOTR, POKE, POS, PRINT, RAD, RANDOMIZE, READ, RELEASE, REM, REMAIN, RENUM, RESTORE, RESUME, RETURN RIGHT$, RND, ROUND, RUN, SAVE, SGN, SIN, SOUND, SPACE$, SPC, SPEED, SQ, SQR, STEP, STOP, STR$, STRING$, SWAP, SYMBOL, TAB, TAG, TAGOFF, TAN, TEST, TESTR, THEN, TIME, TO, TROFF, TRON, UNT, UPPER$, USING, VAL, VPOS, WAIT, WEND, WHILE, WIDTH, WINDOW, WRITE, XOR, XPOS, YPOS, ZONE

CPC664 TECHNICAL SPECIFICATION

LSI CHIPS:

Z80A	processor running at 4MHz
64K	bytes of RAM (over 41K available to user)
32K	bytes of ROM for BASIC and OS
6845	CRT controller device
AY-3-8912	sound generator chip 3 voice, 8 octaves
8255	parallel I/O device

DISPLAY SPECIFICATION:

Display Mode	Mode 1	Mode 2	Mode 0
No. of colours	4 from 27	2 from 27	16 from 27
Vertical dots	320	640	160
Horizontal dots	200	200	200
Horiz. characters	40	80	20

KEYBOARD:

74 keys - qwerty style, numeric cluster, cursor and copy cursor, large enter, shift, caps lock, tab, escape, delete, clear, control.

CASSETTE HANDLING:

Write speed software selectable - 1K baud or 2K baud, read speed automatically established by software. Motor on/off controlled by software.

ADD-ON ABILITY:

Additional compact floppy disc drive system, type FD-1.
Centronics compatable printer.
Joystick(s).
Various peripherals including up to 252 additional 16K ROMs.

EXTERNAL SOCKETS:

PCB edge connectors for general purpose expansion and Centronics parallel printer.
Disc drive 2 socket (Use DI-2 connecting lead)
9 Pin D-type socket for joystick (Amsoft type JY2)
6 Pin DIN socket for - RGB, sync & composite video
5 Pin DIN socket for external cassette recorder
...(Use CL-1 connecting lead)
3.5mm stereo socket for stereo sound output
5mm plug and lead to 12v (disc) power socket on the monitor
5mm socket for CPC664 5v power supply from monitor

DIMENSIONS (mm):	w	h	d
Keyboard	580	70	170
CTM644	375	340	365
GT65	305	315	335
Joystick	90	170	100
Modulator	120	70	170

WEIGHTS (kg):

Keyboard	2.4
CTM644	10.6
GT65	6.3
Joystick	0.3
Modulator	1.4

POWER SUPPLY:

Screen System: 240V AC 50Hz (keyboard and disc drive power supplied by screen system)

Keyboard/computer unit, Colour Monitor, Green Monitor - Designed in U.K., Made in Korea. Joystick - Designed in U.K., Made in Taiwan. Power Supply/Modulator - Designed in U.K., Made in U.K. Software - Written in the UK and U.S.A, Made in Korea and U.K.

Disc system specifications:

The disc drive is a 3" system, conforming to the Hitachi/Panasonic standard. The software is configured for a 12mS step rate, and 30mS settling time.
The system is designed to control a maximum of 2 drives. A ROM contains the extensions for AMSDOS and the machine dependent elements of CP/M and LOGO. The ruggedly constructed 3" discs are usable on both sides, each side is provided with a reusable write protect clip which is slid into position as required.

AMSDOS & CP/M

AMSDOS is a disc operating sytem which expands Locomotive BASIC, adding additional commands to make full use of the disc files. AMSDOS enables BASIC programs to access disc files in the same manner as cassette files, in fact the same commands are used with file names conforming to CP/M conventions. AMSDOS and CP/M both share the same file structure and can read and write each other's files.

The Digital Research CP/M operating system is supplied with the CPC664, permitting the user to access the wealth of applications software written to run under CP/M. In addition to the usual CP/M utilities, additional features have been included for the CPC664.

Disc Organisation:

Both AMSDOS and CP/M support three different disc formats: SYSTEM format, DATA only format, and IBM format.
Format selection is automatic on disc access. All three formats use the same framework, but have different sector configurations.
Common to all:
Single sided, double density.
512 byte sector size.
40 tracks.
Sectors interleaved 2:1.

SYSTEM format:
The most frequently used format, since CP/M may only be loaded from a system format disc. 2K is used for the directory, and 9K reserved for the system.
9 sectors per track.
2 reserved tracks for CP/M.
169K byte file capacity.

DATA only format:
All the tracks are used to store data.
2K bytes reserved for the directory.
9 sectors per track.
No reserved tracks.
178K byte file capacity.

IBM format:
Logically similar to the single sided format used by CP/M on the IBM PC.
2K bytes used for the directory, 4K reserved.
8 sectors per track.
1 reserved track.
154K byte file capacity.

Either side of an AMSTRAD CP/M or AMSDOS disc may be accessed by the disc controller, depending on which way round the disc is inserted.

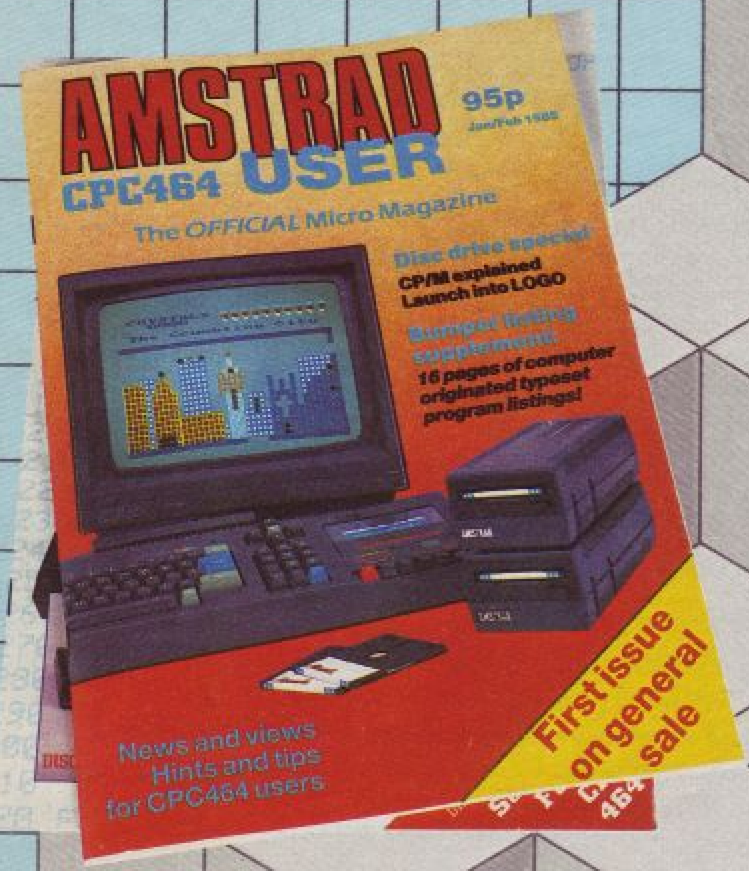
Please note that whilst every care has been taken to ensure compatibility with existing CP/M software, some packages available make use of undocumented features of the CP/M operating system, and these may not be supported by the CPC664 implementation.

Protected cassette files may not be copied to disc, and care should be taken to observe the copyright conditions of any software when transferring programs between cassette and disc.

In keeping with our policy of continually improving our service, and the technical quality of our products, we reserve the right to change component types, manufacturers, sources of supply or technical specification at any time.

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Over 100 titles already available!

A computer is only as useful as its software - and with the CPC664 you have the best of all worlds. High quality games and utilities developed on cassette and disc for the CPC464 will run on the CPC664, plus the plethora of programs developed to operate under CP/M.

High quality arcade games from Amsoft including the famous 'Roland' series will test your reflexes and skills. Utilities such as 'Screen Designer' and 'Devpac' will help you develop graphics and machine code software. Alternative languages such as Pascal, Forth and C will allow you to continue to develop your skills as a programmer.



Remember to register your purchase by returning the guarantee card, and Amstrad will update you with the latest software catalogue and information.

these are interconnected, and which words should be used to go from one to the next (East, West, North, South and so on).

Each of these locations may contain any amount of objects, and each is given a number and description. Special cases are provided for objects that may be worn or objects that produce light (e.g. a torch) etc.

All the verbs and nouns that will be recognised within an adventure are entered into the vocabulary, each being given a separate number. The Quill is really just a very specialised database management system and it is by controlling the interaction of all objects by means of the various number labels that the program functions.

The actual operation of the adventure is controlled by two tables: the event table and the status table. The first is used by the interpreter to hold word pairs that are to have a special action in the adventure (e.g. LIGHT LAMP). Each pair is followed by a list of conditions, and if these are all met when the two words are used then the list of actions is instigated. (e.g. LIGHTing the LAMP may now enable you to see the DIAMOND, but only if the CHEST is OPEN - the conditions would be that the words LIGHT LAMP were entered and that OPEN CHEST had already been entered -the actions would be to make the DIAMOND a visible object then re-describe the location). The status table is very similar, except that the actions in it are not dependent on the typed input - only on other things such as the number of moves taken etc.

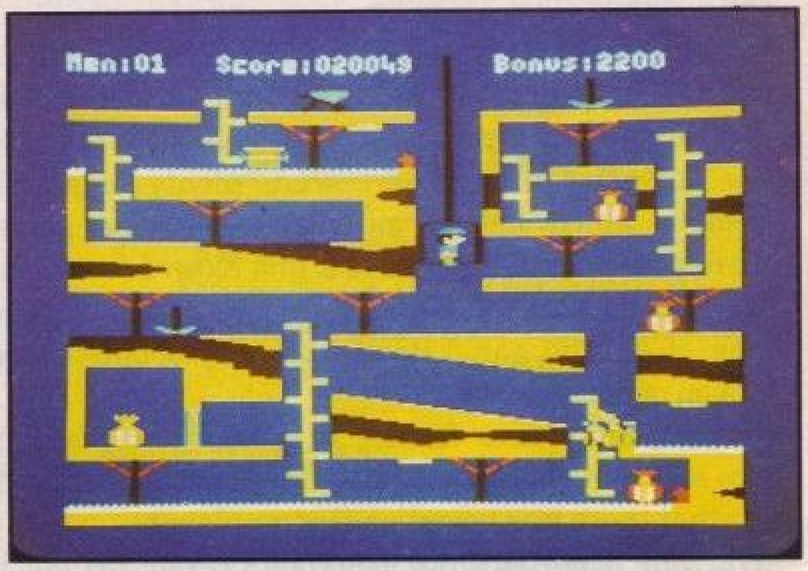
I think it is pretty fair to say that the manual supplied with The Quill is probably one of the best supplied with any computer product currently available (though the implication that the slowness of their editor is in some way caused by the print routines of the Arnold is quite obviously a terminological inexactitude). It is probably this, combined with its ease of use that made this program such a smash hit on the Spectrum - I can't see any reason why this won't also be the case for the Arnold.

AUTHOR:	Gilsoft
FORMAT:	Cassette
PRICE:	£16.95
GRAPHICS:	N/A
PLAYABILITY:	N/A
ADDICTIVENESS:	****
OVERALL:	****

Gilligan's Gold

Gilligan's Gold is based on an arcade game that I remember seeing in a pub a while back. The idea seemed quite good but our august editor informs me that the game never really caught on. It could loosely be described as a platform and ladders game, the object being to tear around a mine attempting to collect sacks of gold that have to be returned to a wheel-barrow at the top of the first screen, the first few sacks are reasonably simple, being quite close, but those on the other screens have to be brought back quite a way, past several obstacles, and are therefore a little tricky. The task is made harder by the fact that a bonus counts down as you try to get a sack to the wheel-barrow and, on reaching zero, your little man loses a life. The count is replenished by successfully returning a sack.

To further hinder your attempts to amass a fortune, several robbers are also hungry for gold and will not hesitate to attack in order to take a sack that you're carrying. It is possible to attack these characters for a short time after you have picked up one of the pick-axes that are lying around (in much the same way as barrels could be smashed in that old arcade classic, Donkey Kong). The pick has another use, to allow you to access one sack that is hidden behind a rock-face that must be broken down. Gold trucks run up and down short sections of railway line. These can be either a help or hindrance. It is possible to hitch a ride by dropping into one as it goes past, but you may also be knocked down, causing an inevitable loss of life. Movement up and down can either be made using



the lifts or climbing the ladders, though you must be careful not to fall down an empty shaft.

Playing the game is fairly easy, but one niggle I have is that you must be exactly 'lined up' in order to get off a ladder at a particular level when being chased by a robber. This will often lead to an unnecessary loss of life.

The one major criticism that I have, concerns the number of screens -there are ONLY THREE! I cannot understand why more were not included - it is surely just a matter of increasing the size of a data table.

The use of colour is also a bit limited; in fact the scrolling high-score table is more colourful than the actual game, though the game does work well on a green screen. And what happened to the sound ? A strangled parrot-squawk every time someone drops, doesn't exactly stretch the 464 to its limits. All in all then, the idea is pretty reasonable, but I'm not sure if this particular implementation is all that it could be, though I did find myself going back to try again.

AUTHOR:	Ocean
FORMAT:	Cassette
PRICE:	£6.90
GRAPHICS:	**
PLAYABILITY:	***
ADDICTIVENESS:	****
OVERALL:	***

War Zone

The first thing I noticed upon opening the cassette case was "Speedload" on Side 1 and "Supersafe" on Side 2. (Different I thought). So I proceeded to load as per, instructions and I was presented with a rather pleasant screen display. After reading the instructions I went on to play. The screen showed a grid marked around the sides with letters and numbers. There are 8 sectors each with a different grid display.

The sound effects were reasonable and added a little more to the general layout. They tell you when it is your go and when you score a hit, which in my case was not very often. There were plenty of screen prompts which helped me understand the game. There are two play speeds fast and slow. I found the instructions a bit confusing at first but I soon got the hang of it. The game itself is a very sophisticated version of battle ships.

With a handy 'save' feature so you can stop playing, save and come back to it later, the only fault I found was that there was no option for two players.

Warzone is perhaps not everyone's cup of tea but it is a good game for those long winter nights.

GRAPHICS:	***
PLAYABILITY:	***
ADDICTIVENESS:	**
OVERALL:	**

Roland Goes Digging

Although quite simple in concept, 'Roland Goes Digging' proved both absorbing and addictive. So much so, in fact, that our tame granny, aged 72, has been caught "zapping" into the wee small hours.

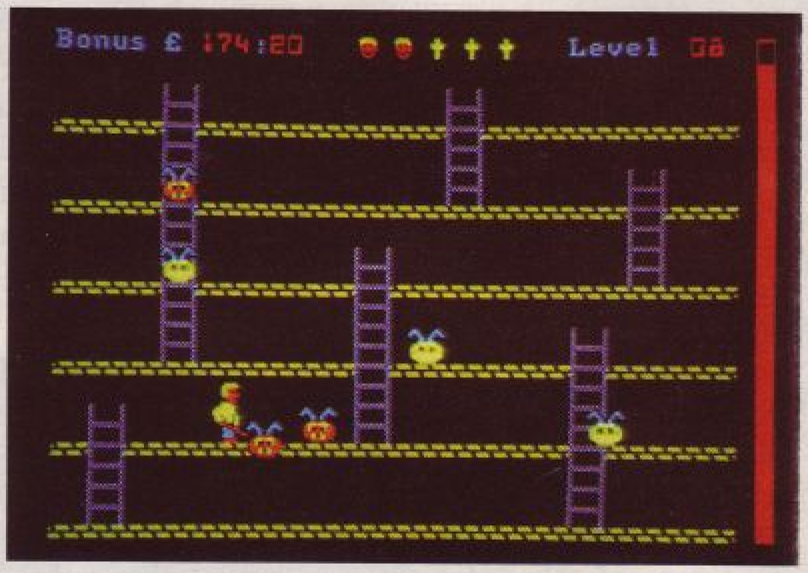
Loading the program could hardly be simpler, and there are playing instructions on screen once the program has loaded.

A choice of joystick or keyboard control is offered, and personally I found the keyboard more satisfactory, athough the children and granny preferred the joystick.

The choice of keys designated for up, down, left and right movement was, to me, questionable, but there is an option within the playing instructions to allow the user to choose which keys he prefers. Somewhat confusingly, we are advised that only alpha-numeric keys may be used - but I am pleased to say that the cursor key group does the job very nicely.

THE GAME? Briefly, the intrepid Roland has got himself a job clearing a building site of unwanted aliens and you must help him earn his bonus.

You have to move Roland, complete with shovel, from floor to floor, digging holes to trap the aliens and then bury them while avoiding getting caught by the same said aliens.



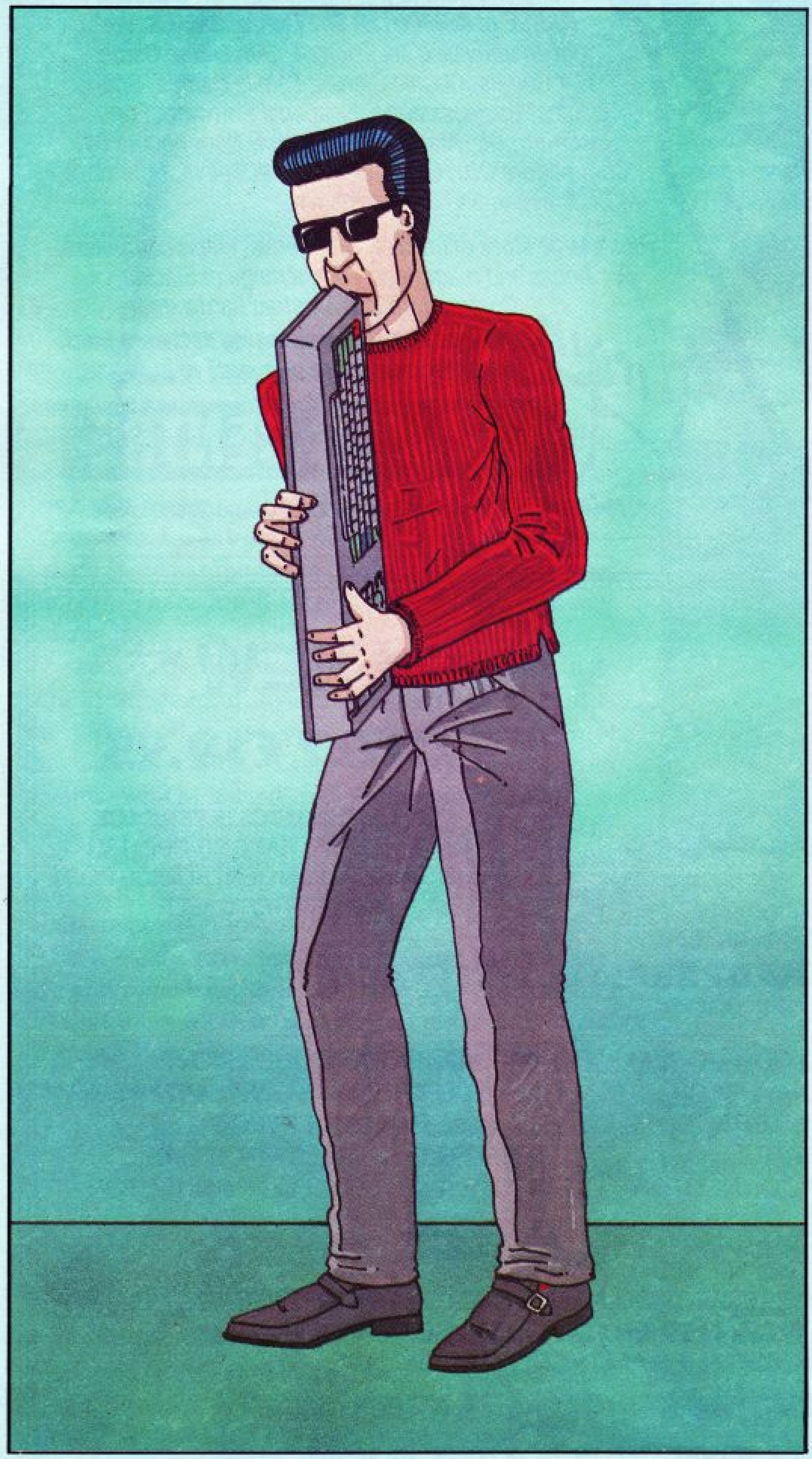
The graphics used are clear and colourful, the animation smooth and the expressions of the angry, escaped aliens hilarious. Even the musical accompaniment to this game is nicely done. If, however, like me, you find the music a little repetitious, it can be turned off without losing the other sound effects. All in all, "Roland Goes Digging" is an amusing and enjoyable game of snakes and ladders where the snakes bite!

AUTHOR:	AMSOFT/GEM
PRICE:	£8.95
FORMAT:	Cassette
GRAPHICS:	***
PLAYABILITY:	****
ADDICTIVENESS:	****
OVERALL:	****

The Musical Amstrad

Part 3

Jeremy Vine



So far in this series we have looked at the basics of sound production and considered the rudimentary elements of musical theory. This month I'm going to take you through the steps of converting sheet music to play on your Amstrad CPC464 and show you how to convert musical timings into a format understandable by the computer.

Without having even covered the ENV and ENT statements, it is still possible to play some impressive music. This month's offering is of a classical flavour and is an example of a BACH canon. Before typing in the listing of program 1, let's consider a new problem. Last month I showed you how to play a series of musical notes but there was one major factor missing - timing.

Musical Notation.

Music would be very dull if every note played was of the same duration. Differences in how long an individual note sounds for, is important in giving a piece of music its unique beat and tempo. But there is more to timing than just the duration of a note. First let's see how different note durations are conveyed in musical notation. It's important to be able to read these basics, otherwise conversion of sheet music to the micro will be virtually impossible!

Figure 1

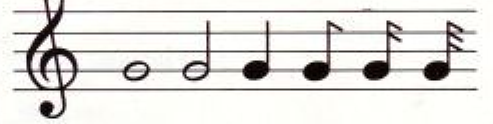
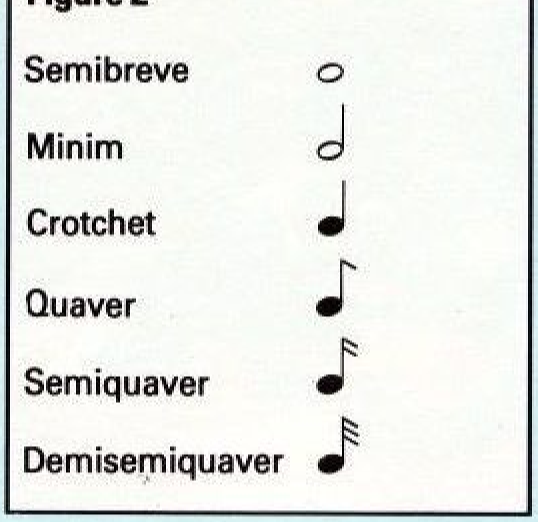


Figure 1 shows the note 'G' (above middle C) a total of six times. But each of the notes are different in that their respective durations are either longer or shorter to the other notes on the stave. Starting from left to right we go from the longest to the shortest. Figure 2 shows these durations and the names by which they are called.

The demisemiquaver is normally the



Figure 2



shortest sounding note, and the semibreve the longest. The duration of any note can be increased one-half by the addition of a dot (.) after the note.

But indications of the duration of sound can be equally applied to periods of silence and this is shown in music by the presence of 'rests'. The names for these rests are the same as those for their counterpart in notes and figure 3 shows the different symbols used to indicate a rest.

The above is very much a lightning guide to the subject and further details can of course be obtained from a good book on musical theory. But now back to the micro.

CONVERTING MUSIC NOTATION

Assuming that you've followed the above. you'll now want to convert a piece of music into a form that the micro can understand. We've already seen how any note can be converted to the appropriate pitch figure; now we need to do the same for the duration parameter of the SOUND statement. Figure 4 shows such a conversion table. All the musical note lengths are shown with their related duration figures for the Amstrad, and if you look at the table carefully you'll see that this makes sense. For instance, a quaver equals 20 and a crotchet 40. Therefore if you wished to play the note 'C' which was a semiquaver, you would enter:

```
SOUND 1,478,10
```

But that's not the end of the story. I've missed out one important factor in the explanation of timing. The explanation of musical time notation does not account for the speed at which a piece of music is played, or if you prefer, the tempo. You might think that crotchets and quavers determine how fast or slow a piece of music is played, but that is not the case.

Musical time values are only an indication of how long any one note is played in relation to another note. These timings are relative to each other. The tempo is something else altogether. Don't forget this point otherwise you'll wonder why your music doesn't sound quite right!

To see what I mean by this, type in program 1. Be very careful when typing in the data statements as it's so easy to make a mistake.

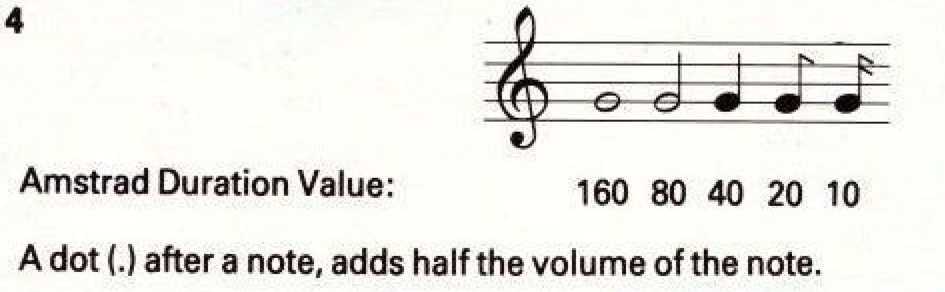
BEGINNERS' BACH

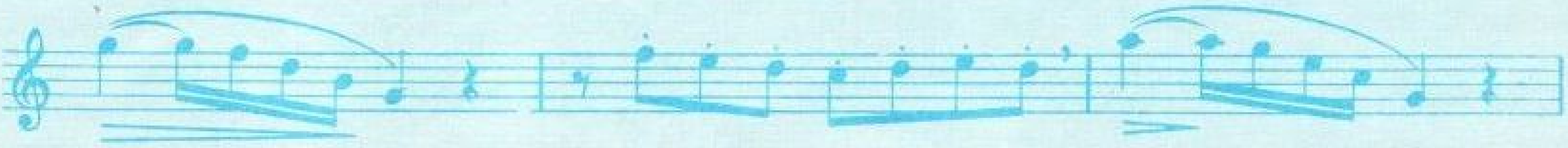
Program 1 employs principles we've learnt over the past two months, but now uses the addition of tempo and note length. Line 140 sets the overall tempo (speed) of the piece. Try altering this figure to see what effect it has on the music. Increasing the value will slow the piece down, while decreasing it has the opposite effect. I've chosen a value of 0.6 as the optimum figure but there's no hard and fast rule, and you might prefer the music slightly slower or faster.

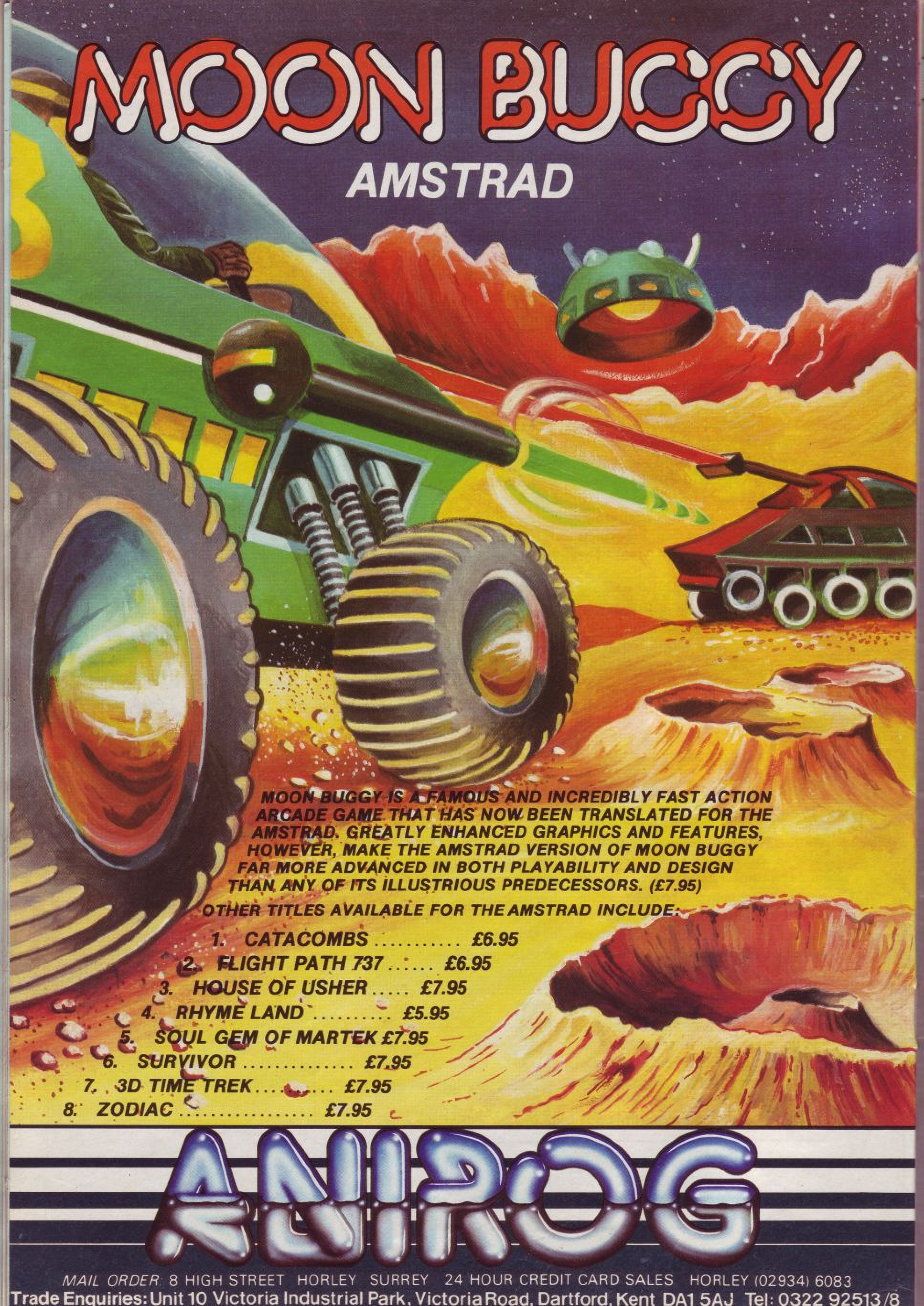
Now look at the DATA statements. This may well look Double-Dutch but it's really quite simple!! The data has been entered in groups of two, where the first value represents the pitch of the note and the second its duration. The pitch value is as described last month and uses the conversion equation (the correct one!). Figure 5 is an extension of the table shown last month and covers the range of notes for three octaves.

Note:	Value:
C	-11
C#	-10
D	-9
D#E	-8
F	-7
F#	-6
G	-5
G#	-4
A	-3
A#	-2
B	-1
C	0
C#	1 (Middle C)
D	23
D#	4
E	5
F	6
F#	7
G	8
G#	9
A	10
A#	11
B	12
C	13
C#	14
D	15
D#	16
E	17
F	18
F#	19
G	20
G#	21
A	22
A#	23
B	24

Figure 4

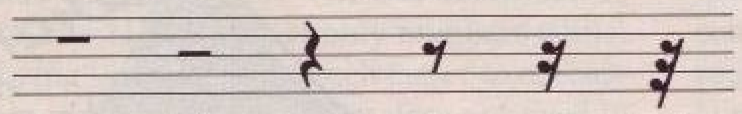






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Figure 3



There is only one value that needs to be explained in line 270 and thats the appearance of the number 161. This value is too high for the human auditory system to notice and can in this piece of music be used to represent a rest. The duration of the rest is same as that for the sounding notes.

Line 180 reads these two values and lines 190 & 200 convert the note value to the correct pitch number. The SOUND statement in line 210 of course plays the appropriate note. Line 210 is also where the 'tempo' value has its effect. The duration parameter is multiplied by the value of 'tempo' to give its overall length. The first FOR...NEXT loop reads in the data values, whilst the outer loop repeats the piece once more but on the second occasion plays it one octave higher. And that's all there is to the program.

However the sound being generated isn't as interesting as it could be. Two possible alternatives can then be considered. Either to develop an Envelope for the instrument to be mimicked (which we haven't covered yet), or to utilise the other sound channels. Just by the addition of extra sound channels you can add a fuller vibrato effect to the piece.

I suggest trying the following to see what effect combining sound channels has the sound generated.

First, let's add channel B. Type in line 215:

```
215 SOUND 2,pitchnum+3,duration*tempo,15,1,0,0
```

The effect is not too drastic but the addition of a third channel changes the whole feel of the music. Note that the 'pitchnum' variable is altered on channels A and B. Now add line 218:

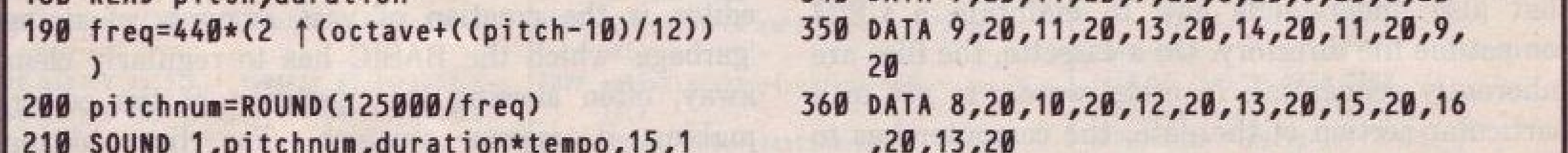
```
218 SOUND 4,pitchnum/2,duration*tempo,15,1,0,0
```

With the combination of sounds on the three channels, the music has more of an instrumental feel than the original. Use the core of program 1 (lines 140 to 230) as a means for entering your own music. You need only sit down with our sheet music and carefully write down each note as a set of pairs, and then enter these figures into data statements. You'll be surprised at the range of music you can create just by using a very simple program.

And that's it for this month. Well, almost! Our esteemed editor has come across a possible error in the user guide - Middle C is, according to the Amstrad Bible, a pitch value of 478. However it has been pointed out to us that the machine is in fact an octave lower than the manual suggests. To rectify matters you need only change the octave parameter from 0 to 1. Then again, you might not think it really matters! At least we do try to be accurate! See you next month.

Listing 1

```
100 REM CLASSICAL AMSTRAD
110 REM JEREMY VINE a la BACH!!
120 REM AMSTRAD USER MAY 1985
130 :
140 tempo = 0.6  ' Sets speed of music
150 FOR octave = 0 TO 1
160 RESTORE 270
170 FOR x=1 TO 87
180 READ pitch,duration
190 freq=440*(2 ↑(octave+((pitch-10)/12))
    )
200 pitchnum=ROUND(125000/freq)
210 SOUND 1,pitchnum,duration*tempo,15,1
    ,0,0
220 NEXT
230 NEXT 'Repeat, but one octave higher
240 :
250 REM MUSIC DATA
260 :
270 DATA 1,80,4,80,8,80,9,80,0,80,161,40
    ,8,80,6,80,6,80,5,80,4,80,3,40
280 DATA 2,40,1,40,0,40,-4,40,1,40,6,40,
    4,80,3,80
290 DATA 1,80,4,80,8,20,6,20,8,20
300 DATA 13,20,8,20,4,20,3,20,4,20
310 DATA 6,20,8,20,10,20,12,20,13,20,4,2
    0,6,20
320 DATA 8,20,9,20,3,20,4,20,6,20,8,20
330 DATA 6,20,4,20,3,20,4,20,6,20,8,20
340 DATA 9,20,11,20,9,20,8,20,6,20,8,20
350 DATA 9,20,11,20,13,20,14,20,11,20,9,
    20
360 DATA 8,20,10,20,12,20,13,20,15,20,16
    ,20,13,20
370 DATA 11,20,9,20,12,20,13,20,15,20,16
    ,20
380 DATA 18,20,15,20,8,20,15,20,13,20,15
    ,20
390 DATA 16,20,18,20,16,20,15,20,13,20,1
    2,20,13,40,8,40,4,40,1,40
```



Roland's Diary Program



Roland Perry introduces two routines written in BASIC, one for Random Access file handling, the other for User Friendly screen input. He also claims the prize for the first published program to have both a '464 and '664 version!

At AMSOFT we are often asked about 'Random Access' files on disc. What random access means is that the program can read and write information from any part of a disc file or database 'at random'. This is very similar to the way in which we can already access any part of an array in RAM memory equally easily. In our example below there is a diary comprising 365 daily entries. The size of each entry has been chosen as 120 characters (4 lines each of 30 characters) which gives a total file size of 43,800 bytes. This is clearly too big to fit in the computer's RAM all at once (on top of the 10K or thereabouts of BASIC program) so the program will have to involve file to file operations as we update the diary.

AMSDOS is really a fast cassette operating system that also understands how to maintain a CP/M compatible file directory. On a cassette, the files are inherently sequential; in other words, to get to a particular section of the data, the computer has to start at the beginning and read through until it gets to the required information. The BASIC supplied with the computer only attempts to handle sequential files. The problem with trying to construct our diary program when all the data is in one 43K sequential file, is that it brings a new meaning to the expression 'Waiting for Christmas'!

Random Access to disc files is built into the CP/M operating system -indeed it is one of the reasons why CP/M is so popular. Rather than rewriting the diary program to run under CP/M there is a solution possible in Locomotive BASIC. Only the 464 version needs an optional 'cheat' in assembler (Obtained by patching the AMSDOS Open File routine.) The program simulates Random Access filing by splitting the data into a number of small sections, each of which is actually accessed sequentially. Each section of the file is only ever created when the first entry to that section is made. In other words there is no need to 'Format' the disc with a set of empty file sections before running the program. The assembler routine (464 only) parallels the DERR function built into the 664, which allows us to detect (by stumbling over a 'file not found' error when we open for input) whether a section already exists, and if not, then we start one.

The editing keystrokes supported by the BASIC input line editor considerably enhance the user interface available to applications programs. However, editing previously inputted data is not possible using normal BASIC 'INPUT' commands, but instead must be programmed using INKEY$ function calls. Often programmers stop once they have implemented the backspace key, very rarely taking the time to implement the CLR and cursor keys. A normal side-effect of constructing such a line editor is the creation of vast amounts of string 'garbage' which the BASIC has to regularly clear away, often slowing the operation of the editor, making it appear sluggish. The line editing sub-routine within the diary program runs virtually as fast as the BASIC line editor and implements backspace and CLR, insert mode, and all four cursor keys (both normal and control). Extensive use is made of the MID$ command to stop the generation of string garbage.

Operating the Diary program is simplicity itself. There are a large number of windows set up, most of which are used by the screen editor. Input is always to WINDOW 0, ensured by a WINDOW SWAP command. A cursor is created in line 7070 and removed in line 7110 by firmware calls (464) or by the

new command CURSOR (664). The line editor can be instructed in line 7130 to accept only numbers whilst the date is being typed in. It is much faster to,operate in Read Only mode, as the program does not need to allow for file updating. Each field in the line editor (and each of the four main lines in the diary, is treated as a separate field) can be modified either by typing in characters, or by using the left and right cursor keys (normal and control), CLR and DEL keys. The up and down cursor keys (normal and control) and the ENTER key allow us to move from field to field. When editing the diary text, a single COPY keystroke is required to save the modified text and return to the date inputting mode. The normal ESC/ESC sequence will close all the files and exit cleanly.

In the CPC464 version a modification is made to AMSDOS by the assembler program 'INROUT.BIN' which patches the jumpblock entry which is responsible for opening files. When CALLed normally, it sets up the jumpblock redirection. The code to which it is redirected has the effect of storing any returned error code (such as 'File does not Exist') but reporting to the BASIC that the operation was successful. When CALLed in conjunction with an integer parameter, that integer parameter is returned containing the stored error code. This procedure is required to prevent the BASIC 1.0 from returning to Direct Mode after the error. The initialising sub-routine from line 4000 loads the code file in. If the routine is used in programs which have further |DISC/|TAPE etc., commands, then a fresh 'CALL discerr' will be required after each of these, because the Jumpblock will have been restored to its unpatched condition. A small BASIC program is printed below which creates the file 'INROUT.BIN'

On a CPC664, BASIC 1.1 will detect a filing system error as ERROR 32 and can report the exact nature of the error by the function DERR. The program lines 5180 to 5220 contain the file opening and error detecting commands. BASIC 1.1 allows the direct use of strings in external commands, slightly clarifying lines 5370 and 5380. The DEC$ function, in many ways similar to PRINT USING, tidies up line 4030 considerably. The garbage collector of BASIC 1.1 is much faster than before, so the use of MID$ in most places in the editor is less important, but has been left in for clarity. Needless to say, the 464 version will still work on the 664 (the upwards compatibility that AMSOFT has always promised).

```
100 ' Roland's Diary Program
110 ' Copyright 1985 Amstrad Consumer Electronics Plc
120 '
130 reclen=120:f$="diary"
140 GOSUB 4000 ' initialise random access
150 GOSUB 6000 ' initialise editor
160 '
170 brk=(1=0):ON BREAK GOSUB 8000
180 '
190 MODE 1
200 '
210 WINDOW #1,1,40,25,26:PEN #1,0
220 WINDOW #2,1,40,1,24
230 WINDOW #3,6,35,5,6:PAPER #3,3:PEN #3,1
240 WINDOW #4,6,35,7,10:PAPER #4,3:PEN #4,2
250 WINDOW #5,5,6,1,1:PAPER #5,3:PEN#5,2
260 WINDOW #6,15,16,1,1:PAPER #6,3:PEN#6,2
270 WINDOW #7,39,39,1,1:PAPER #7,3:PEN#7,2
280 CLS #3:LOCATE #3,1,2:PRINT #3,STRING$(30,154);:CLS#4
290 '
300 LOCATE #2,1,15:PRINT#2,"COPY write to Diary,      ESC ESC Quit"
310 LOCATE #2,1,17:PRINT#2,"The diary can be examined rapidly using the Read Only Y option. To update the   diary use the Read Only N option and     normal keyboard editing keys."
320 '
330 RESTORE:DATA 31,28,31,30,31,30,31,31,30,31,30,31
340 mth$="JanFebMarAprMayJunJulAugSepOctNovDec"
350 sfx$="stndrdthththththththththththththththththstndrdthththththththst"
360 DIM m(12):FOR mth=1 TO 12:READ m(mth):NEXT:ro$="N"
370 '
1000 LOCATE #2,1,1:PRINT #2,"Day     Month         Read Only (Y/N)":CLS #5:CLS #6:CLS#7:PRINT#7,ro$;
1010 d$="  ":m$="  "
1020 ed$=d$:edx=1:edy=1:edwindow=5:num=(1=1)
1030 GOSUB 7000:rc=ASC(edin$)
1040 IF rc=255 THEN 3000
1050 MID$(d$,1)=ed$:IF rc=13 AND VAL(d$)>0 THEN 1070
1060 IF rc=241 OR rc=249 THEN 1070 ELSE 1020
1070 ed$=m$:edx=1:edy=1:edwindow=6:num=(1=1)
1080 GOSUB 7000:rc=ASC(edin$)
1090  IF rc=255 THEN 3000
1100 MID$(m$,1)=ed$:IF rc=13 AND VAL(m$)>0 THEN 1130
1110 IF rc=240 OR rc=248 THEN 1020
1120 IF rc=241 OR rc=249 THEN 1130 ELSE 1070
1130 ed$=ro$:edx=1:edy=1:edwindow=7:num=(1=0)
1140 GOSUB 7000:rc=ASC(edin$):ro$=UPPER$(ed$)
1150 IF rc=255 THEN 3000
1160 IF rc=13 AND (ro$="Y" OR ro$="N") THEN 1180
1170 IF rc=240 OR rc=248 THEN 1070 ELSE 1130
1180 d=VAL(d$):mth=VAL(m$)
1190 IF mth<1 OR mth>12 OR d<1 THEN 1020 ELSE IF d>m(mth) THEN 1020
1200 days=d:FOR mc=2 TO mth:days=days+m(mc):NEXT
1210 '
1220 rec=days
1230 '
2000 GOSUB 5000
2010 LOCATE #3,11,1:PRINT #3,USING "##";d;:PRINT #3,MID$(sfx$,d*2-1,2);" ";MID$(mth$,mth*3-2,3)
2020 IF newfile AND (ro$="Y") THEN CLS#4:GOTO 1000
2030 ed$=STRING$(30," ")
2040 FOR y=3 TO 0 STEP -1
2050  MID$(ed$,1)=MID$(o$,y*30+1,30):LOCATE #4,1,y+1:PRINT #4,ed$;
2060 NEXT y
2070 IF ro$="Y" THEN 1000
2080 edy=1:edx=1:edwindow=4
2090 GOSUB 7000:rc=ASC(edin$)
2100  MID$(o$,edy*30-29,30)=ed$
2110  IF rc=255 THEN 3000 ELSE IF rc=224 THEN 2160
2120  IF rc=248 THEN py=1 ELSE IF rc=249 THEN py=4
2130  IF rc=240 THEN edy=MAX(edy-1,1) ELSE IF rc=241 OR rc=13 THEN edy=MIN(edy+1,4)
2140  IF rc=13 THEN edx=1
2150 MID$(ed$,1)=MID$(o$,edy*30-29,30):GOTO 2090
2160 c$=o$:GOSUB 5000
2170 GOTO 1000
2180 '
3000 PRINT"";:c$=o$:GOSUB 5300:MODE 1:PAPER 0:PEN 1:END
```

```
3010 '
4000 ' initialise random access
4010 '
4020 recperfile=2048\(reclen+4)
4030 DEF FNameS(ext)=f$+"."+RIGHT$("00"+
     MID$(STR$(ext),2,LEN(STR$(ext))-1),
     3)
4040 openrd=-1:openwr=-1:cache=-1:|DISC
4050 MEMORY HIMEM-&C6:discerr=HIMEM+1
4060 LOAD "inrout.bin",discerr:MEMORY HI
     MEM-1:CLOSEIN
4070 CALL discerr
4080 RETURN
4090 '
5000 'simulate random access writing
5010 '
5015 IF LEN(c$)>reclen THEN c$=LEFT$(c$,
     reclen) ELSE IF LEN(c$)<reclen THEN
      c$=c$+SPACE$(reclen-LEN(c$))
5020 file= rec\recperfile
5030 frec= rec-(file*recperfile)
5040 IF (frec<cache) OR (ro$="N" AND ope
     nwr=-1) THEN 5150
5050 IF file=openrd THEN 5070
5060 IF file<>openwr THEN 5150
5070 IF frec=cache THEN o$=c$:RETURN
5080 FOR tr=cache TO frec
5090  IF tr=cache THEN r$=c$:GOTO 5110
5100  IF newfile THEN r$=STRING$(reclen,
     " ") ELSE INPUT #9,r$
5110  IF (tr<>frec) AND (file=openwr) TH
     EN WRITE #9,r$
5120 NEXT tr
5130 o$=r$:cache=frec
5140 RETURN
5150 ' need to open a new file
5160 GOSUB 5300
5170 IF ro$="Y" THEN openrd=file ELSE op
     enwr=file
5180 WINDOW SWAP 1,0
5190 OPENIN FName$(file)
5200 WINDOW SWAP 0,1
5210 fail%=0:CALL discerr,@fail%:IF fail
     %=0 THEN 5220 ELSE IF fail%=146 THE
     N newfile=(1=1):GOTO 5220 ELSE GOTO
      5410
5220 IF newfile AND (ro$="Y") THEN CLOSE
     IN:RETURN
5230 IF openwr<>-1 THEN OPENOUT "$.tmp"
5240 FOR tr=0 TO frec
5250  IF newfile THEN r$=STRING$(reclen,
     " ") ELSE INPUT #9,r$
5260  IF (tr<>frec) AND (openwr<>-1) THE
     N WRITE #9,r$
5270 NEXT tr
5280 o$=r$:MID$(r$,1)=c$+STRING$(reclen,
     " "):cache=frec
5290 RETURN
5300 IF (openwr=-1) THEN CLOSEIN:GOTO 53
     90
5310 FOR tr=cache TO recperfile-1
5320  IF tr=cache THEN r$=c$:GOTO 5340
5330  IF newfile THEN r$=STRING$(reclen,
     " ") ELSE INPUT #9,r$
5340  WRITE #9,r$
5350 NEXT tr
5360 CLOSEOUT:CLOSEIN
5370 ff$=FName$(openwr):IF NOT newfile T
     HEN |ERA,@ff$
5380 tt$="$.TMP":|REN,@ff$,@tt$
5390 newfile=(1=0):openwr=-1:openrd=-1
5400 RETURN
5410 '
6000 'initialise line editor
6010 '
6020 RESTORE 6030
6030 DATA 13,&f0,&f1,&7f,&10,&f2,&f3,&f8
     ,&f9,&fa,&fb,&e0
6040 FOR edinit=1 TO 12:READ testchr:edt
     est$=edtest$+CHR$(testchr):NEXT
6050 edin$=CHR$(&FF)
6060 RETURN
6070 '
7000 ' text editor
7010 '
7020 edlen=LEN(ed$):WINDOW SWAP 0,edwind
     ow
7030 FOR edrt=edlen TO 1 STEP -1
7040  IF MID$(ed$,edrt,1)<>" " THEN 7060
7050 NEXT
7060 edrt=edrt+1
7070 LOCATE edx,edy:CALL &BB81
7080 MID$(edin$,1)=CHR$(&FF):MID$(edin$,
     1)=INKEY$
7090 IF brk THEN MID$(edin$,1)=CHR$(255)
     :GOTO 7340
7100 IF edin$=CHR$(&FF) THEN 7080
7110 CALL &BB84:ON INSTR(edtest$,edin$)
     GOTO 7340,7340,7340,7240,7260,7210,
     7300,7340,7340,7190,7320,7340
7120 ' insert a char
7130 IF num AND (edin$<"0" OR edin$>"9")
      THEN 7070
7140 IF edx<edlen THEN MID$(ed$,edx+1,ed
     len-edx)=MID$(ed$,edx,edlen-edx)
7150 MID$(ed$,edx,1)=edin$:edrt=MIN(MAX(
     edrt+1,edx+2),edlen+1)
7160 IF edrt=1 THEN 7170 ELSE IF MID$(ed
     $,edrt-1,1)=" " THEN edrt=edrt-1:GO
     TO 7160 ELSE GOTO 7170
7170 IF edx<edrt THEN PRINT MID$(ed$,edx
     ,edrt-edx); ELSE PRINT edin$;
7180 edx=MIN(edlen,edx+1):GOTO 7070
7190 ' shift left cursor
7200 edx=1:GOTO 7070
7210 ' left cursor
7220 edx=MAX(1,edx-1)
7230 GOTO 7070
7240 ' backspace delete
7250 IF edx=1 THEN 7070 ELSE edx=edx-1
7260 ' clr delete
7270 MID$(ed$,edx,edlen-edx)=MID$(ed$,ed
     x+1,edlen-edx):IF edrt=edlen+1 THEN
      MID$(ed$,edlen,1)=" "
7280 LOCATE edx,edy:IF edrt>edx THEN PRI
     NT MID$(ed$,edx,edrt-edx);
7290 IF edrt=1 THEN 7070 ELSE IF MID$(ed
     $,edrt-1,1)=" " THEN edrt=edrt-1:GO
     TO 7290 ELSE GOTO 7070
7300 ' right cursor
7310 edx=MIN(edlen,edx+1):GOTO 7070
7320 ' shift right cursor
7330 edx=edlen:GOTO 7070
7340 ' exit the subroutine
7350 WINDOW SWAP 0,edwindow:RETURN
7360 '
8000 brk=(1=1):RETURN
```



Modifications for the 664:

```
3010 MODE 1:PEN 1:PRINT"Disc error";DERR
     :END
```

```
4030 DEF FName$(ext)=f$+DEC$(ext/1000,".###")
Delete 4050-4070
```

```
5180 PEN #1,0:WINDOW SWAP 1,0:ON ERROR G
     OTO 5192
5190 OPENIN FName$(file):GOTO 5200
5192 RESUME 5194
5194 IF DERR=146 THEN newfile=(1=1):GOTO
      5220 ELSE GOTO 3010
5200 ON ERROR GOTO 0:WINDOW SWAP 0,1:PEN
      #1,1
DELETE 5210
```

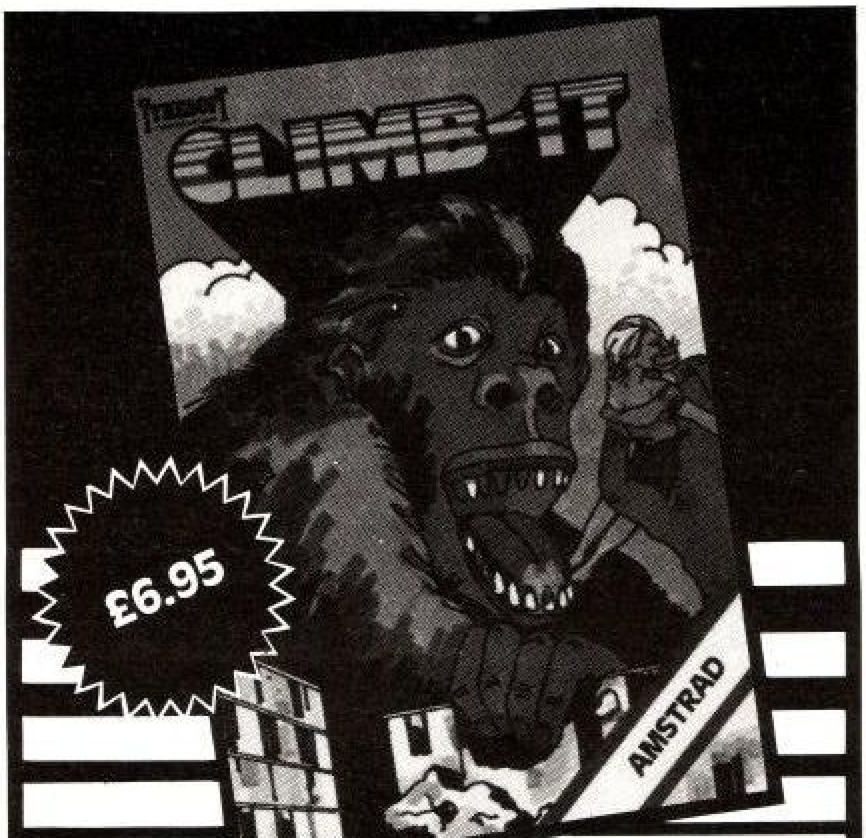
```
5370 IF NOT newfile THEN |ERA,FName$(ope
     nwr)
5380 |REN,FName$(openwr),"$.TMP"
```

```
7070 LOCATE edx,edy:CURSOR 1
```

```
7110 CURSOR 0:ON INSTR(edtest$,edin$) GO
     TO 7340,7340,7340,7240,7260,7210,73
     00,7340,7340,7190,7320,7340
```

Machine code patch for CPC464 to simulate part of the DERR function

```
10 REM make INROUT.BIN
20 MEMORY &9FFF
30 FOR n=0 TO &C5
40  READ h$:POKE n+&A000,VAL("&"+h$)
50 NEXT
60 SAVE "inrout.bin",b,&A000,&C6
100 DATA 21,E1,E9,22,30,00,FE,01,28,0A,F
    7,11,AF,00,19,E5
101 DATA DD,E1,18,0E,F7,11,A3,00,19,7E,D
    D,6E,00,DD,66,01
102 DATA 77,C9,01,0A,00,DD,7E,01,FE,00,C
    8,67,DD,6E,00,E5
103 DATA EB,F7,EB,18,19,DD,E5,E1,23,23,D
    D,36,07,C3,DD,75
104 DATA 08,DD,74,09,E1,EB,F7,EB,18,17,D
    D,09,18,D7,7E,DD
105 DATA 77,04,23,7E,DD,77,05,23,7E,DD,7
    7,06,EB,23,23,23
106 DATA E9,DD,7E,07,77,23,DD,7E,08,77,2
    3,DD,7E,09,77,EB
107 DATA 23,23,23,E9,E5,D5,C5,F7,11,46,0
    0,19,11,77,BC,01
108 DATA 03,00,ED,B0,C1,D1,E1,CD,77,BC,E
    5,C5,D5,F5,F7,11
109 DATA 2B,00,19,E5,DD,E1,21,77,BC,EB,F
    7,EB,18,C3,F7,11
110 DATA 19,00,19,F1,F5,77,F1,38,09,3E,1
    6,FE,00,37,D1,C1
111 DATA E1,C9,F5,36,00,F1,18,F6,00,00,7
    7,BC,18,B6,00,00
112 DATA 00,00,00,00,00,00
```



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Program notes.

LISTING 1.

This generates the two pieces of machine-code used by the main program. The program checks the data as it is entered - if there is an error, the line in which it has occurred is printed; otherwise you are told how to save the code.

A quick way of entering the data statements is by using the following:

```
KEY 139, CHR$(13) + "DATA "
```

and then using AUTO. The effect of this is that every time you enter a line of data using the small enter key, the DATA part of the next line is written for you.

LISTING 2.

This program sets up the user-defined characters and loads in the machine-code routines before running CARGO2 - the main program.

LISTING 3.

This is the main program. The last routine may be of interest to some people, as it allows for a 40-character display on a mode '0' screen, hence 16 colours. When the routine is called, it prints each letter held in MESSAGE$ in the graphics ink at the graphics position. As far as I took the routine, it allows for all upper-case characters and a few special characters but this could easily be extended.

TYPING INSTRUCTIONS

Type in listing 1; do not renumber this listing. You need not run this program yet, just save it. Type in listing 2 and save as "CARGO" Reset the computer and load listing 1 and run it. The program tells you to:
Do this directly after "CARGO"

Now type in listing 3 and save as "CARGO2" after the first two programs.

```
15 ' *************************************
20 ' ***   L I S T I N G   O N E   ***
25 ' *************************************
30 MODE 1:LOCATE 8,13:PRINT"CODE NOW BEI
   NG GENERATED":MEMORY 36999:RESTORE 10
   0:LN=100
40 FOR A=37000 TO 37499 STEP 9:GOSUB 70:
   NEXT A
50 FOR A=38000 TO 38269 STEP 9:GOSUB 70:
   NEXT A
60 MODE 1:LOCATE 17,5:PEN 3:PRINT"CODE O
   K":LOCATE 9,10:PEN 2:PRINT"NOW SAVE T
   HE CODE USING":LOCATE 7,13:PEN 1:PRIN
   T"SAVE ";CHR$(34);"CARGOMC";CHR$(34);
   ",B,37000,1500":LOCATE 1,22:END
70 CS=0:FOR B=A TO A+8:READ N$:V=VAL("&"
   +N$):CS=CS+V:POKE B,V:NEXT
80 READ N$:V=VAL("&"+N$):IF CS=V THEN LN
   =LN+10:RETURN
90 MODE 1:LOCATE 11,11:PRINT"DATA ERROR
   IN LINE";LN:LOCATE 1,22:END
100 DATA CD,24,BB,FE,00,28,14,CB,3F,3F0
110 DATA 38,17,CB,3F,38,26,CB,3F,38,2F9
120 DATA 33,CB,3F,38,44,CB,3F,38,53,34E
130 DATA 3E,00,32,AB,8C,18,51,F5,2A,32F
140 DATA A6,8C,3E,14,BD,28,05,23,23,2B4
150 DATA 22,A6,8C,F1,CB,3F,18,DA,F5,536
160 DATA 2A,A6,8C,3E,EA,BD,28,05,2B,399
170 DATA 2B,22,A6,8C,F1,18,C9,F5,2A,470
180 DATA A4,8C,3E,B0,BD,28,07,01,FC,407
190 DATA FF,09,22,A4,8C,F1,CB,3F,18,46D
200 DATA BC,F5,2A,A4,8C,3E,60,BD,28,48E
210 DATA 07,01,04,00,09,22,A4,8C,F1,258
220 DATA 18,A9,3E,01,32,AB,8C,2A,A0,333
230 DATA 8C,ED,4B,A4,8C,09,22,AC,8C,457
240 DATA 3E,02,BC,20,0D,3E,80,BD,30,2D4
250 DATA 18,21,E0,FF,22,AC,8C,18,10,39A
260 DATA 3E,FF,BC,20,0B,3E,BE,BD,38,415
270 DATA 06,21,70,02,22,AC,8C,2A,A2,2BF
280 DATA 8C,ED,4B,A6,8C,09,22,AE,8C,45B
290 DATA 3E,02,BC,20,06,3E,02,32,AA,23E
300 DATA 8C,C9,ED,5B,A0,8C,2A,A2,8C,521
310 DATA CD,C0,BB,3E,20,CD,FC,BB,3E,568
320 DATA 20,CD,FC,BB,3A,A8,8C,FE,00,510
330 DATA 28,0E,11,D0,FF,21,F0,FF,CD,4F3
340 DATA C3,BB,3E,20,CD,FC,BB,ED,5B,5A8
350 DATA AC,8C,2A,AE,8C,CD,F0,BB,06,51A
360 DATA 06,C5,18,0A,C5,11,0C,00,21,1F0
370 DATA 00,00,CD,F3,BB,FE,00,20,24,3BD
380 DATA C1,10,EF,11,C4,FF,21,F0,FF,5A4
390 DATA 06,06,C5,CD,F3,BB,18,0A,C5,433
400 DATA 11,0C,00,21,00,00,CD,F3,BB,2B9
410 DATA FE,00,20,05,C1,10,EF,18,06,301
420 DATA C1,3E,01,32,AA,8C,11,00,00,279
430 DATA 21,08,00,CD,F3,BB,FE,00,20,3C2
440 DATA EE,11,C4,FF,21,00,00,CD,F3,4A3
450 DATA BB,FE,00,20,E1,3A,A8,8C,FE,526
460 DATA 00,28,41,11,10,00,21,EA,FF,294
470 DATA CD,F3,BB,FE,00,20,CD,11,10,487
480 DATA 00,21,00,00,CD,F3,BB,FE,00,39A
490 DATA 20,C0,11,10,00,21,00;00,CD,1EF
500 DATA F3,BB,FE,00,20,B3,11,00,00,390
510 DATA 21,0A,00,CD,F3,BB,FE,00,20,3C4
520 DATA A6,11,E0,FF,21,00,00,CD,F3,477
530 DATA BB,FE,00,20,99,3A,AA,8C,FE,4E0
540 DATA 00,C0,2A,A4,8C,3E,FC,BD,28,439
550 DATA 1F,3E,00,BD,28,1A,3E,04,BD,25B
560 DATA 28,15,3E,FF,BC,28,08,21,F5,37C
570 DATA F6,22,B2,8C,18,0E,21,F7,F8,48C
580 DATA 22,B2,8C,18,06,21,F9,FA,22,3B4
590 DATA B2,8C,ED,5B,AC,8C,ED,53,A0,59E
600 DATA 8C,2A,AE,8C,22,A2,8C,CD,C0,4CD
610 DATA BB,3A,B0,8C,CD,DE,BB,3A,B2,583
620 DATA 8C,CD,FC,BB,3A,B3,8C,CD,FC,652
630 DATA BB,3A,A8,8C,FE,00,C8,11,D0,4D0
640 DATA FF,21,F0,FF,CD,C3,BB,3E,FB,693
650 DATA CD,FC,BB,C9,00,00,00,00,00,34D
660 DATA 3A,9C,95,47,3E,00,B8,C8,DD,44D
670 DATA 21,83,95,C5,11,32,00,DD,19,337
680 DATA DD,6E,01,DD,66,02,DD,4E,05,3C1
690 DATA DD,46,06,09,3E,02,BC,20,08,256
700 DATA 3E,80,BD,30,03,21,E0,FF,DD,48B
710 DATA 7E,0C,FE,FD,28,0C,3E,FF,BC,4B2
720 DATA 20,07,21,80,02,18,02,18,CD,1C9
730 DATA DD,75,0D,DD,74,0E,DD,6E,03,40C
740 DATA DD,66,04,DD,4E,07,DD,46,08,3A4
750 DATA 09,DD,7E,09,FE,00,28,46,3E,317
760 DATA 01,BC,28,39,DD,7E,0A,BD,38,378
770 DATA 33,DD,6E,03,DD,66,04,DD,75,41A
780 DATA 0F,DD,74,10,DD,6E,07,DD,66,405
790 DATA 08,23,DD,75,07,DD,74,08,3E,31B
800 DATA 00,DD,77,09,21,00,00,DD,5E,2B9
810 DATA 07,DD,56,08,ED,52,DD,75,07,3DA
820 DATA DD,74,08,18,27,18,A6,DD,75,3A8
830 DATA 0F,DD,74,10,18,1D,3E,00,BC,29F
840 DATA 28,F3,3E,16,BD,30,EE,DD,6E,495
850 DATA 03,DD,66,04,DD,75,0F,DD,74,3FC
860 DATA 10,3E,01,DD,77,09,18,C6,DD,367
870 DATA 5E,01,DD,56,02,DD,6E,03,DD,3BF
880 DATA 66,04,DD,E5,CD,C0,BB,3E,20,4D2
890 DATA CD,FC,BB,DD,E1,DD,5E,0D,DD,667
900 DATA 56,0E,DD,73,01,DD,72,02,DD,3E3
910 DATA 6E,0F,DD,66,10,DD,75,03,DD,402
920 DATA 74,04,DD,E5,CD,C0,BB,DD,E1,640
930 DATA DD,7E,0B,DD,E5,CD,DE,BB,DD,66B
940 DATA E1,DD,7E,0C,DD,E5,CD,FC,BB,68E
950 DATA DD,E1,C1,10,8B,C9,00,00,00,3E3
```

```
10 ' *************************************
20 ' ***   L I S T I N G   T W O   ***
30 ' *************************************
40 SYMBOL AFTER 128
50 a=127:SYMBOL 129,a,a,a,a,a,a,a,a
60 a=255:SYMBOL 255,a,a,a,a,a,a,a,a
70 RESTORE 170:FOR a=245 TO 253:READ q,w
   ,e,r,t,y,u,i:SYMBOL a,q,w,e,r,t,y,u,i
   :NEXT a
80 RESTORE 180:FOR a=130 TO 162:READ q,w
   ,e,r,t,y,u,i:SYMBOL a,q,w,e,r,t,y,u,i
   :NEXT a
90 MODE 0:BORDER 11:INK 0,7:INK 1,11:FOR
    X=0 TO 636 STEP 8:PLOT X,0,1:DRAW X,
   398:PLOT 636-X,0:DRAW 636-X,400:NEXT
100 FOR X=0 TO 640 STEP 8:PLOT X,0,0:DRA
    W 640-X,400:NEXT:FOR Y=4 TO 396 STEP
     4:PLOT 640,Y:DRAW 0,400-Y:NEXT
110 INK 2,0,26:INK 3,18:INK 4,24:INK 5,2
    6,0
120 PEN 5:LOCATE 6,9:PRINT"CARGO KING":P
    EN 4:LOCATE 10,12:PRINT"BY"
130 PEN 3:LOCATE 6,15:PRINT"AB GARDNER":
```

```
     PLOT 150,116,2:TAG:PRINT"NOW LOADING
     ";:TAGOFF
140 CLEAR:MEMORY 36000
150 LOAD "!CARGOMC"
160 CLEAR:CHAIN "!CARGO2"
170 DATA 31,160,65,163,127,3,1,7,255,64,
    252,18,18,252,17,254,255,2,63,72,72,
    63,136,127,248,5,130,197,254,192,128
    ,224,127,1,7,10,10,7,4,4,254,128,224
    ,80,80,224,32,32,0,129,129,255,255,2
    55,255,129,254,16,120,171,174,121,16
    8,124,127,8,158,213,117,158,21,62
180 DATA 85,85,85,127,85,85,85,127,56,72
    ,56,8,8,28,62,127,15,160,65,163,127,
    3,1,7,255,64,252,18,18,252,17,254,24
    0,96,255,246,255,111,15,6
190 DATA 0,115,132,100,20,148,99,0,0,25,
    165,37,37,165,25,0,0,207,40,46,200,7
    2,47,0,0,0,0,0,0,0,0,14,9,14,9,9
    ,14,0,0,50,75,74,74,74,50,0,0,46,105
    ,174,41,41,46,0,0,56,64,48,8,72,48,0
    ,0,30,16,28,16,16,16,0,0,151,148,151
    ,148,148,103,0
200 DATA 0,160,32,32,32,32,188,0,0,3,4,3
    ,1,5,2,0,0,103,84,102,68,68,71,0,0,5
    2,69,69,69,69,53,0,0,144,80,208,80,8
    0,92,0,0,98,85,101,85,85,98,0,0,117,
    85,85,85,85,87,0,0,48,64,32,16,80,32
    ,0,0,65,65,127,127,127,127,85
210 DATA 86,84,118,84,86,0,0,0,151,149,1
    50,148,212,0,0,0,38,85,86,85,37,0,0,
    0,112,32,32,32,32,0,0,0,3,7,15,31,31
    ,15,7,3,192,224,240,248,248,240,224,
    192,252,135,133,253,221,237,253,252,
    127,8,158,245,31,18,63,0,98,144,18,3
    4,68,72,9,70

10 ' **********************************
20 ' ***  L I S T I N G  T H R E E  ***
30 ' **********************************
40 ' *** INTRODUCTION SCREEN + CUBE ***
50 BORDER 16:MODE 1:CLS:INK 0,21:INK 1,0
   :INK 2,26:INK 3,2:PEN 1:LOCATE 11,10:
   PRINT"C A R G O   K I N G":PRINT"
       ";STRING$(21,238):LOCATE 20,14:P
   RINT"BY":LOCATE 15,16:PRINT"A.B.Gardn
   er.":LOCATE 18,18:PRINT CHR$(164);" 1
   985"
60 FOR Y=400 TO 0 STEP -16:PLOT 0,Y,3:DR
   AWR 640,0:DRAW Y,0,2:MOVE 640-Y,0:DRA
   W 0,Y,2:NEXT:Y=0
70 DEFINT c-y:s=1:c=2:t=16:x=320:y=328:W
   INDOW #1,18,23,3,7:PLOT 270,288,3:DRA
   WR 0,78:MOVER 98,0:DRAWR 0,-78:PAPER
   #1,1:CLS #1
80 FOR A=1 TO 50:A$=INKEY$:NEXT
90 A1=0:A2=2:A3=3:PRINT CHR$(22)+CHR$(1)
   :PLOT 150,398,2:TAG:PRINT"PRESS ANY K
   EY TO START";:TAGOFF:LOCATE 10,1:PRIN
   T"PRESS ANY KEY TO START";:PRINT CHR$
   (22)+CHR$(0):PLOT 130,384,3:DRAWR 380
   ,0
100 FOR r=t-1 TO 0 STEP -1:s=s+c:d=SQR(2
    *s ↑2):p=(d-(d*r)/t)/2:q=s*r/t:e=d/2:
    CLS #1:PLOT x,y-(p*2+q)/2,1
110 DRAWR e,p,A2:DRAWR 0,q,A3:DRAWR-e,-p
    ,A1:DRAWR-e,p:DRAWR e,p:DRAWR e,-p:M
    OVER-e,-p:DRAWR 0,-q,A3:DRAWR-e,p,A2
    :DRAWR 0,q,A3:IF INKEY$<>"" THEN 270
     ELSE NEXT:FOR r=1 TO t:s=s+c
120 d=SQR(2*s ↑2):p=(d-(d*r)/t)/2:q=s*r/t
    :e=d/2:CLS #1:PLOT x,y+(p*2-q)/2
130 DRAWR e,-p,A1:DRAWR -e,-p:DRAWR -e,p
    :DRAWR e,p:MOVER e,-p:DRAWR 0,q,A3:D
    RAWR -e,p,A2:DRAWR -e,-p,A2:DRAWR 0,
    -q,A3:MOVER e,p:DRAWR 0,q,A3:IF INKE
    Y$="" THEN NEXT ELSE 270
140 IF A1=0 THEN A1=2:A2=0 ELSE A1=0:A2=
    2
150 IF s>60 OR s<20 THEN c=-c:GOTO 100 E
    LSE 100
160 ' *** COPE WITH <OUT OF MEMORY> ***
170 SPEED INK 2,2:INK 0,RND*26,RND*26:T(
    5)=T(5)/50:FOR A=37600 TO 37649:POKE
     A,0:NEXT:FOR A=1 TO 6:POKE 37600+A,
    T(A):NEXT:A$=STR$(S):POKE 37609,LEN(
    A$):FOR A=2 TO LEN(A$):POKE 37608+A,
    VAL(MID$(A$,A,1)):NEXT:POKE 37620,B:
    POKE 37621,FX/4
180 INK 0,RND*26,RND*26:FOR A=37630 TO 3
    7634:POKE A,ASC(MID$(SB$,A-37629,1))
    :NEXT:POKE 37635,NP1:POKE 37636,L:PO
    KE 37637,NH:POKE 37638,NC:POKE 37639
    ,NL:POKE 37640,SB:POKE 37641,RR:POKE
     37642,X/4+50:POKE 37643,Y/2
190 INK 0,RND*26,RND*26:CLEAR:INK 0,RND*
    26,RND*26:FOR A=1 TO 6:T(A)=PEEK(376
    00+A):NEXT:T(5)=T(5)*50:S=0:A1=PEEK(
    37609):FOR A=0 TO A1-2:S=S+PEEK(3760
    8+A1-A)*10 ↑A:NEXT:B=PEEK(37620):FX=P
    EEK(37621)*4:X=(PEEK(37642)-50)*4:Y=
    PEEK(37643)*2
200 INK 0,RND*26,RND*26:SB$="":FOR A=376
    30 TO 37634:SB$=SB$+CHR$(PEEK(A)):NE
    XT:NP1=PEEK(37635):L=PEEK(37636):NH=
    PEEK(37637):NC=PEEK(37638):NL=PEEK(3
    7639):SB=PEEK(37640):RR=PEEK(37641):
    L$=STRING$(20,255)
210 INK 0,RND*26,RND*26:k$=CHR$(153):w$=
    CHR$(129):b$=CHR$(130):t$=CHR$(131):
    d$=CHR$(134):z$="  ":FOR a=135 TO 15
    2:z$=z$+CHR$(a):NEXT a:sb$(1)="B":sb
    $(2)="O":sb$(3)="N":sb$(4)="U":sb$(5
    )="S":sb$(6)=d$:sb$(7)=k$:sb$(8)=CHR
    $(161):sb$(9)=CHR$(162)
220 INK 0,RND*26,RND*26:heli$=CHR$(154)+
    CHR$(155)+CHR$(156)+CHR$(157):mc1=37
    000:mc2=38000:DIM C(12)
230 INK 0,RND*26,RND*26:FOR a=2 TO 10:no
    $(a,2)=" HELICOPTERS LEFT":NEXT:no$(
    1,2)=" HELICOPTER LEFT":no$(0,2)="YO
    UR LAST ONE LEFT":RESTORE 240:FOR a=
    1 TO 10:READ no$(a,1):NEXT:NO$(0,1)=
    ""
240 DATA ONE,TWO,THREE,FOUR,FIVE,SIX,SEV
    EN,EIGHT,NINE,TEN
250 INK 0,RND*26,RND*26:ON BREAK GOSUB 1
    430
260 SPEED INK 10,10:INK 0,0:ON PEEK(3765
    0) GOTO 320,540
270 DEFREAL B-Z:DIM t(6),c(12),sb$(9),no
    $(10,2):RANDOMIZE TIME:t(1)=5:t(2)=2
    0:t(3)=1:t(4)=10:t(5)=1000:t(6)=0
280 ENV 1,9,1,1,1,0,5,9,-1,2:ENT 1,5,1,1
    ,10,-1,1,10,1,1,10,-1,1,5,1,1:ENV 2,
    5,1,1,5,-1,1:ENV 3,3,2,2,3,-2,2:ENV
    5,5,1,1,5,-1,1:ENV 6,5,-1,1,5,1,1:EN
    T 3,10,2,2:ENT 9,200,-1,1
290 SB$="*****":POKE 37650,1:GOTO 170
300 ' ***   SET  UP  MENU  SCREEN   ***
310 DATA 1 or B,special Bonus,2 or C,Con
    trols,3 or E,End,4 or G,start the Ga
    me,5 or H,Hints,6 or I,Instructions,
    7 or M,Modify game,8 or S,Scoring,9
    or W,Warnings
320 MODE 1:INK 0,8:INK 1,1:PEN 1:BORDER
    15,14:LOCATE 18,2:PRINT"MENU":INK 2,
    26:INK 3,24:RESTORE 310:FOR a=4 TO 2
    0 STEP 2:READ a1$,a2$:PEN 2:LOCATE 1
    0,a:PRINT a1$;:PEN 3:LOCATE 20,a:PRI
    NT a2$;:NEXT:PEN 3:LOCATE 8,22:PRINT
    "Please enter your choice";:PEN 2
330 PRINT" ?":LOCATE 2,24:PEN 1:PRINT"DU
    RING GAME USE SPACE BAR TO PAUSE GAM
    E.";:PEN 2
340 FOR A=1 TO 50:A$=INKEY$:NEXT
350 a$=UPPER$(INKEY$):IF a$="" THEN 350
    ELSE LOCATE 33,22:PRINT a$;:a=INSTR(
    "123456789BCEGHIMSW",a$):IF a=0 THEN
     SOUND 2,400,25:GOTO 350
360 IF a=3 OR a=12 THEN MODE 2:INK 0,26:
    INK 1,1:PEN 1:BORDER 26:END
370 nh=t(1)-1:l=t(3):s=0:b=30:f=999:sb$=
    "*****":SOUND 2,99,25:a=a+(a>9)*9:ON
     a GOTO 2690,2550,1500,390,2430,2370
    ,2740,2650,2480
380 ' *** I N I T I L I S A T I O N ***
390 RESTORE 2100:FOR a=0 TO 15:READ d:IN
    K a,d:NEXT:MODE 0:BORDER 8:PEN 1:PAP
    ER 0:FOR y=16 TO 30:PLOT 0,y,15:DRAW
     640,y:NEXT y:PRINT CHR$(22)+CHR$(1)
    :PEN 12:LOCATE 1,24:PRINT z$;
400 FOR x=1 TO 20:c=RND*8+2:FOR y=23 TO
    23-RND*5+(l<6)*l+(l>5)*6 STEP -1:PEN
     1:LOCATE x,y:PRINT w$:PEN c:LOCATE
    x,y:PRINT b$;:NEXT y:LOCATE x,y:PRIN
    T t$;:NEXT:LL=L:PEN 2
410 IF ll>18 THEN ll=ll-11-INT(ll/18):GO
    TO 410 ELSE ON ll GOSUB 2120,2130,21
    40,2150,2160,2170,2180,2190,2200,221
    0,2220,2230,2240,2250,2260,2270,2290
    ,2300
420 PRINT CHR$(22)+CHR$(0):nl=0:PEN 2
430 GOSUB 1400:GOSUB 1410:GOSUB 1420
440 FOR a=36000 TO 36020:POKE a,0:NEXT:P
    OKE 36000,32:POKE 36002,114:POKE 360
    03,1:POKE 36016,3:POKE 36035,238:GOS
    UB 1040:GOSUB 2040
450 GOSUB 810:GOSUB 1040
460 ' ***   START   THE   GAME     ***
470 EI:EVERY 11,3 GOSUB 610:EVERY 11,2 G
    OSUB 620:AFTER RND*T(5)+250,1 GOSUB
    710:EVERY 300-l*10-(L>26)*L*10,0 GOS
    UB 600
480 IF PEEK(36010)>0 THEN 500 ELSE IF PE
    EK(36011)>0 THEN GOSUB 630
490 IF INKEY$=" " THEN 1450 ELSE 480
500 DI:GOSUB 3000:CALL 37000:FOR a=0 TO
    3:dd=REMAIN(a):NEXT
510 FOR a=0 TO np1:POKE 38336+a*50,0:NEX
    T:CALL 38000
520 IF JJ=1 THEN LOCATE BX,BY:PRINT" ":J
    J=0
530 POKE 37650,2:GOTO 170
540 IF PEEK(36008)=1 THEN POKE 36008,0:G
    OSUB 880
550 IF PEEK(36010)=2 THEN 800
560 IF PEEK(36010)=1 THEN 830
570 IF PEEK(36010)=3 THEN CALL 37000:GOT
    O 790
580 IF PEEK(36010)=4 THEN PLOT 0,370,2:T
    AG:PRINT"    ";:TAGOFF:FOR a=36004 T
    O 36010:POKE a,0:NEXT:POKE 36000,32:
    POKE 36001,0:CALL 37000:GOTO 940
590 IF PEEK(36010)=5 THEN 1220
600 fx=fx-4:IF fx=312 THEN POKE 36010,3:
    RETURN ELSE DI:MOVE fx,0:DRAW fx,14,
    2:EI:RETURN
610 CALL 37000:SOUND 130,450,0,0,1,1:RET
    URN
620 CALL 38000:IF jj=1 THEN 740 ELSE RET
    URN
630 POKE 36011,0:GOSUB 3000:IF PEEK(3600
    8)<>1 THEN 660
640 IF TEST(x+16,y-34)<>12 OR TEST(x+44,
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    y-34)<>12 THEN 480
650 DI:PLOT x+16,y-16,12:TAG:PRINT CHR$(
    251);:TAGOFF:POKE 36008,0:POKE 36006
    ,0:POKE 36007,0:EI:nc=nc+1:S=S+500:G
    OSUB 1400:IF nc>=t(2) THEN NC=0:POKE
     36010,5:RETURN ELSE RETURN
660 IF x>68 OR y>371 OR y<345 OR nl=t(4)
     OR PEEK(36018)<>249 THEN 670 ELSE P
    OKE 36010,4:FOR a=0 TO 3:dd=REMAIN(a
    ):NEXT:RETURN
670 IF jj=1 OR y>280 OR y<80 THEN 690 EL
    SE IF b=0 THEN RETURN ELSE b=b-1:DI:
    bx=INT(x/32)+2:IF bx<1 THEN bx=1 ELS
    E IF bx>20 THEN bx=20
680 EI:by=27-INT(y/16):jj=1:GOTO 1410
690 IF y>68 THEN RETURN ELSE IF (x MOD 3
    2)=16 OR x=-20 THEN DI:FOR a=36004 T
    O 36007:POKE a,0:NEXT:POKE 36008,1:P
    OKE 36006,2:LOCATE INT(x/32)+2,23:PR
    INT" ":EI:s=s+250:GOTO 1400 ELSE RET
    URN
700 RETURN
710 RR=INT(RND*9)+1:DI:PEN RR+2:LOCATE 1
    ,1:PRINT SB$(RR):EI:SB=1:AFTER RND*T
    (5)+250,1 GOSUB 720:RETURN
720 DI:LOCATE 1,1:PRINT" ":EI:SB=0:AFTER
     RND*T(5)*10+250,1 GOSUB 710:RETURN
730 RETURN
740 by=by+1:SOUND 5,by+55,0,2,3,6:t1=TES
    T(bx*32-16,400-by*16+8):IF by>=23 TH
    EN DI:GOTO 760 ELSE IF t1>0 THEN s=s
    +25:h1=1:GOSUB 1400
750 DI:LOCATE bx,by-1:PRINT" ":PEN 9:LOC
    ATE bx,by:PRINT d$:RETURN
760 jj=2:IF t1=0 THEN a1$=" " ELSE a1$=k
    $:IF t1<>10 THEN s=s+25:GOSUB 1400
770 PEN 10:SOUND 5,250,0,2,1,1,9:DI:LOCA
    TE bx,by-1:PRINT" ":LOCATE bx,by:PRI
    NT a1$:jj=0:EI:RETURN
780 ' ***   OUT OF FUEL OR OXYGEN   ***
790 INK 14,11:PLOT 25,270,14:Message$="Y
    OUR HELICOPTER JUST RAN OUT OF FUEL"
    :GOSUB 3150:FOR a=1 TO 26:INK 14,a:S
    OUND 2,a*20,10:FOR t=1 TO 75:NEXT t,
    a:GOTO 830
800 INK 14,21:PLOT 25,270,14:Message$="Y
    OU WENT TOO HIGH AND SO YOUR ENGINES
    ":GOSUB 3150:PLOT 18,252:Message$="R
    AN OUT OF OXYGEN TO BURN AND STOPPED
    !":GOSUB 3150:FOR a=1 TO 26:INK 14,a
    :SOUND 2,a*a,10:FOR t=1 TO 75:NEXT t
    ,a:GOTO 830
810 FOR a=316 TO 416 STEP 4:SOUND 2,420-
    a,2:MOVE a,0:DRAW a,14,7:NEXT:fx=420
    :RETURN
820 ' ***       C R A S H E D        ***
830 SOUND 1,200,200,5,0,9:SOUND 2,250,20
    0,5,0,9:SOUND 4,300,200,5,0,9
840 c=9:FOR a=-6 TO 80 STEP 6:a1=TEST(x-
    a,y+a):PLOT x-a,y+a,c:a2=TEST(x+32,y
    +a):PLOT x+32,y+a:a3=TEST(x+64+a,y+a
    ):PLOT x+64+a,y+a:a4=TEST(x-a,y-8):P
    LOT x-a,y-8
850 a5=TEST(x+64+a,y-8):PLOT x+64+a,y-8:
    a6=TEST(x-a,y-16-a):PLOT x-a,y-16-a:
    a7=TEST(x+32,y-16-a):PLOT x+32,y-16-
    a:a8=TEST(x+64+a,y-16-a):PLOT x+64+a
    ,y-16-a
860 PLOT x-a,y+a,a1:PLOT x+32,y+a,a2:PLO
    T x+64+a,y+a,a3:PLOT x-a,y-8,a4:PLOT
     x+64+a,y-8,a5:PLOT x-a,y-16-a,a6:PL
    OT x+32,y-16-a,a7:PLOT x+64+a,y-16-a
    ,a8:NEXT
870 nh=nh-1:IF nh=-1 THEN 2320 ELSE 890
880 a1=16:WHILE TEST(a1,40)>0:a1=a1+32:W
    END:PRINT CHR$(22)+CHR$(1);:a1=INT(a
    1/32)+1:c=RND*8+2:FOR j=23 TO 23-RND
    *5+(l<6)*l+(l>5)*6 STEP -1:PEN 1:LOC
    ATE a1,j:PRINT w$:PEN c:LOCATE a1,j:
    PRINT b$;:NEXT:LOCATE a1,j:PRINT t$;
    CHR$(22)+CHR$(0):RETURN
890 LOCATE 1,9:PRINT SPACE$(20);:PRINT S
    PACE$(20)
900 INK 14,7:PLOT 25,270,14:Message$="ON
    E HELICOPTER GONE AND YOU ONLY HAVE"
    :GOSUB 3150:PLOT 10,252:Message$=no$
    (nh,1)+no$(nh,2)+" SO BE CAREFUL !!!
    !!!":GOSUB 3150:FOR a=1 TO 26:INK 14
    ,a:SOUND 2,a*a,10:FOR t=1 TO 75:NEXT
     t,a
910 FOR a2=1 TO 3:FOR a1=3+a2 TO 8+a2:FO
    R a=1 TO 40 STEP 2.5:s3=a*a+a+a1*10:
    SOUND 2,s3,1:NEXT a,a1,a2:SOUND 2,s3
    +5,20:LOCATE 1,9:PRINT SPACE$(20);:P
    RINT SPACE$(20);
920 GOTO 440
930 ' ***         L A N D E D        ***
940 nl=nl+1:INK 14,2:PLOT 240,270,14:Mes
    sage$="WELL DONE !":GOSUB 3150:PLOT
    22,252,14:Message$="YOU HAVE LANDED
    YOUR HELICOPTER SAFELY":GOSUB 3150:F
    OR a=1 TO 79:INK 14,(a MOD 26)+1:SOU
    ND 1,a,5,1,1:SOUND 4,81-a,5,1,1:FOR
    t=1 TO 50:NEXT t,a
950 IF sb=0 THEN 990 ELSE sb=0:LOCATE 1,
    1:PRINT" ";:LOCATE 1,9:PRINT SPACE$(
    20);:PRINT SPACE$(20)
960 IF RR=9 AND NC=0 THEN RR=INT(RND*8)+
    1
970 IF rr<6 THEN 1110 ELSE ON rr-5 GOTO
    1170,1190,1140,1210
980 FOR t=1 TO 100:INK 14,RND*26:FOR a=1
     TO 20:NEXT a,t
990 LOCATE 1,9:PRINT SPACE$(20);:PRINT S
    PACE$(20)
1000 INK 14,8:PLOT 80,270,14:Message$="T
     WO MORE BOMBS HAVE BEEN LOADED":GOS
     UB 3150:FOR a=1 TO 2:b=b+1:LOCATE 7
     ,25:PRINT b;:FOR a1=1 TO 10:INK 14,
     a1+a*7:SOUND 1,a1*a*12,0,1,3:FOR t=
     1 TO 25:NEXT t,a1,a
1010 LOCATE 1,9:PRINT SPACE$(20)
1020 INK 14,24:PLOT 40,270:Message$="YOU
     R FUEL TANKS ARE BEING REFILLED":GO
     SUB 3150:FOR a=fx TO 416 STEP 0.5:I
     NK 14,RND*25:SOUND 2,420-a,2:MOVE a
     ,0:DRAW a,14,7:NEXT:INK 14,14:fx=42
     0:FOR t=1 TO 1000:NEXT t
1030 LOCATE 1,9:PRINT SPACE$(20):POKE 36
     010,0:POKE 36011,0:FOR a=0 TO np1 S
     TEP 50:POKE 38336+a,RND*10+3:NEXT:G
     OSUB 1040:GOTO 470
1040 y1=PEEK(36035)-16
1050 a2=0:FOR x1=12 TO 640 STEP 32:IF TE
     ST(x1,y1)<>0 THEN a2=1
1060 NEXT:IF a2=0 THEN y1=y1-16:GOTO 105
     0 ELSE IF y1<75 THEN y1=55
1070 POKE 36035,y1+16:RETURN
1080 rr=INT(RND*9)+1:DI:PEN 13:LOCATE 1,
     1:PRINT sb$(rr);:sb=1:AFTER RND*t(5
     )/2+200,0 GOSUB 1090:RETURN
1090 DI:LOCATE 1,1:PRINT" ";:AFTER RND*t
     (5)+500,0 GOSUB 1080:sb=0:RETURN
1100 ' ***  SPECIAL BONUS FEATURES  ***
1110 sb$=LEFT$(sb$,rr-1)+sb$(rr)+RIGHT$(
     sb$,5-rr):LOCATE 15,25:PRINT sb$;:I
     NK 14,11:PLOT 80,270,14:Message$="S
     UPER BONUS ADDS 1000 POINTS":GOSUB
     3150:FOR a=1 TO 100:INK 14,RND*26:s
     =s+10:GOSUB 1400:SOUND 1,a,1:SOUND
     4,100-a,1:NEXT
1120 IF sb$<>"BONUS" THEN 980
1130 sb$="*****":LOCATE 15,25:PRINT sb$;
     :LOCATE 1,9:PRINT SPACE$(20);:PRINT
      SPACE$(20)
1140 INK 14,18:PLOT 90,270,14:Message$="
     YOU WIN AN EXTRA HELICOPTER":GOSUB
     3150:nh=nh+1:FOR a=1 TO 50 STEP 5:F
     OR a1=a+25 TO 175-a STEP 3:SOUND 1,
     a1+50,1:NEXT a1:FOR a1=175-a TO a+2
     5 STEP -3:SOUND 4,a1+50,1:NEXT a1,a
     :SOUND 4,a1+50,20
1150 IF nh>10 THEN nh=10
1160 PLOT 50,252:Message$="YOU NOW HAVE
     "+no$(nh,1)+no$(nh,2):GOSUB 3150:GO
     TO 980
1170 r=INT(RND*8)+2:nfb=nfb+r:INK 14,16:
     PLOT 130,270:Message$="YOU RECIEVE"
     +STR$(R)+" EXTRA BOMBS":GOSUB 3150:
     PLOT 184,252:Message$="AND"+STR$(R)
     +" X 100 POINTS":GOSUB 3150
1180 FOR a=1 TO r:b=b+1:s=s+100:GOSUB 14
     00:LOCATE 7,25:PRINT b;:FOR a1=2 TO
      8:SOUND 2,a1*a*10,0,1,3:INK 14,a+a
     1:NEXT a1,a:GOTO 980
1190 INK 14,24:PLOT 4,270,14:Message$="Y
     OU WIN 250 POINTS FOR EACH CRATE LA
     NDED":GOSUB 3150:FOR a=1 TO nc:FOR
     a1=1 TO 5:s=s+50:GOSUB 1400:SOUND 1
     ,a*25+a1*25,0,5,5:SOUND 4,600-a*25-
     a1*25,0,10,6:INK 14,a+a1:FOR t=1 TO
      40:NEXT t,a1,a:GOTO 980
1200 ' ***   END  OF  GAME  LEVEL   ***
1210 sl=0:SPEED INK 1,1:INK 0,0,26:FOR a
     1=1 TO 3:FOR a=1 TO 50:SOUND 1,a,1:
     SOUND 4,100-a,1:NEXT a:FOR a=50 TO
     1 STEP -1:SOUND 1,a,1:SOUND 4,100-a
     ,1:NEXT a,a1:SPEED INK 10,10:GOTO 1
     500
1220 FOR y=0 TO 400 STEP 8:PLOT 0,y,6:DR
     AW 640,y:SOUND 2,y,1:NEXT
1230 FOR y=398 TO 0 STEP -8:PLOT 0,y,5:D
     RAW 640,y:SOUND 2,y+50,1:NEXT
1240 FOR y=4 TO 396 STEP 8:PLOT 0,y,4:DR
     AW 640,y:SOUND 2,y+100,1:NEXT
1250 FOR y=394 TO 0 STEP -8:PLOT 0,y,3:D
     RAW 640,y:SOUND 2,y+150,1:NEXT
1260 INK 0,2:MODE 1:BORDER 7:INK 1,26:PE
     N 1:LOCATE 11,2:PRINT"Level";l;"Com
     pleted !":LOCATE 16,4:PRINT"Bonus X
     ";:IF l<6 THEN bm=l ELSE bm=INT(l/5
     )+4
1270 PRINT bm;:INK 2,0:INK 3,19:PEN 2:f=
     (fx-316)*5:LOCATE 9,7:PRINT"Fuel Re
     maining  ";f:LOCATE 9,8:PRINT"Fuel
     Bonus     ";f;"X";bm;"X 1":PEN 3:L
     OCATE 9,10:PRINT"Fuel Bonus       ";
     f*bm:s=s+f*bm:PEN 2
1280 LOCATE 9,12:PRINT"Bombs Remaining "
     ;b:LOCATE 9,13:PRINT"Bomb Bonus
      ";b;"X";bm;"X 20";:PEN 3:LOCATE 9
     ,15:PRINT"Bomb Bonus        ";b*bm*20
     :s=s+b*bm*20:PEN 2
1290 LOCATE 9,17:PRINT"Landings Made   "
     ;nl;"Out Of";t(4):LOCATE 9,18:PRINT
     "Landing Bonus   ";t(4)-nl;"X";bm;"
     X 50":s=s+(t(4)-nl)*50*bm:PEN 3:LOC
     ATE 9,20:PRINT"Landing Bonus     ";(t
     (4)-nl)*50*bm:PEN 2
1300 PEN 2:LOCATE 9,22:PRINT"Total Bonus
     ";MID$(STR$(f*bm),2);"+";MID$
     (STR$(b*bm*20),2);"+";MID$(STR$((t(
     4)-nl)*50*bm),2):PEN 3:LOCATE 9,24:
     PRINT"Total Bonus       ";f*bm+b*bm*2
     0+(t(4)-nl)*50*bm
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1310 LOCATE 9,25:PRINT"Press 'FIRE' to continue";
1320 FOR a=0 TO 100 STEP 0.05:SOUND 1,INT(SIN(a)*100)+100,1,5:SOUND 4,INT(COS(a)*100)+150,1,5:IF JOY(0)<16 THEN NEXT:GOTO 1320
1330 CLS:BORDER 22,24:INK 0,2:INK 1,26:PEN 1:l=l+sl+1:sl=0:IF l<1 THEN l=1
1340 LOCATE 10,5:PRINT"You Are Now On Level";l:LOCATE 10,8:PRINT"You Have";nh;"Helicopters":b=31-l:IF b<15 THEN b=15
1350 LOCATE 4,11:PRINT"You Start This Level With";b;"Bombs":LOCATE 10,14:PRINT"Your Score Is Now";s:LOCATE 8,17:PRINT"Your Special Bonus Is ";sb$
1360 LOCATE 15,21:PRINT"Good Luck !"
1370 INK 2,0,22:PEN 2:LOCATE 9,25:PRINT"Press 'FIRE' to continue";
1380 FOR a=1 TO 15:SOUND 1,a+20,a:SOUND 4,40-a,a:SOUND 2,a+20,1:IF JOY(0)>15 THEN 1390 ELSE NEXT:FOR a=15 TO 1 STEP -1:SOUND 1,a+20,a:SOUND 4,40-a,a:SOUND 2,a+20,1:IF JOY(0)<16 THEN NEXT:GOTO 1380
1390 EI:GOTO 390
1400 DI:LOCATE 1,25:PRINT USING"######";s;:LOCATE 1,1:EI:RETURN
1410 DI:LOCATE 7,25:PRINT b;:LOCATE 1,1:EI:RETURN
1420 DI:LOCATE 15,25:PRINT sb$;:LOCATE 1,1:RETURN
1430 MODE 2:INK 0,26:INK 1,0:PEN 1:PAPER 0:BORDER 7:SPEED KEY 10,2:END
1440 ' ***  P A U S E   M O D E   ***
1450 DI:FOR A=0 TO 3:DD=REMAIN(A):NEXT:LOCATE 1,9:PRINT SPACE$(20);:PRINT SPACE$(20):INK 14,26:PLOT 80,270,14:Message$="TYPE -- S -- TO STOP THIS GAME":GOSUB 3150:PLOT 88,252:Message$="TYPE -- C -- TO CONTINUE GAME":GOSUB 3150
1460 A$=UPPER$(INKEY$):IF A$="C" THEN LOCATE 1,9:PRINT SPACE$(20);:PRINT SPACE$(20):GOTO 470
1470 IF A$="S" THEN RUN 50
1480 INK 14,RND*26:GOTO 1460
1490 ' ***   SPECIAL BONUS SCREEN   ***
1500 MODE 0:BORDER 16:INK 0,0:CLS:PLOT 10,376,6:Message$="TIME":GOSUB 3150:FOR A=1 TO 3:SCT(2,A)=0:SCT(1,A)=0:NEXT
1510 PLOT 0,294,9:MOVER 636,0:DRAWR 0,60:DRAWR -636,0:DRAWR 0,-60:PLOT 214,294:DRAWR 0,60:PLOT 428,294:DRAWR 0,60
1520 PLOT 0,0,9:DRAWR 636,0:DRAWR 0,60:MOVER -636,0:DRAWR 0,-60:PLOT 214,0:DRAWR 0,60:PLOT 428,0:DRAWR 0,60
1530 FOR x=90 TO 630 STEP 4:PLOT x,364,7:DRAWR 0,12:SOUND 5,x,2:SOUND 2,650-x,2:NEXT:tx=630
1540 INK 1,6:PLOT 60,350,1:Message$="POINTS      HELICOPTERS      POINTS":GOSUB 3150
1550 UD=2:INK 2,9,21:PLOT 62,18,2:Message$="POINTS       LEVELS         POINTS":GOSUB 3150
1560 INK 14,2:PLOT 10,270,14:Message$="S P E C I A L  B O N U S  S C R E E N":GOSUB 3150:PLOT 10,252:DRAWR 620,0
1570 PLOT 50,235:Message$="FLY INTO A GREEN SECTION AVOIDING":GOSUB 3150
1580 PLOT 66,215:Message$="CONTACT WITH ANYTHING AND PRESS":GOSUB 3150
1590 PLOT 50,195:Message$="FIRE TO OBTAIN THE RELEVANT BONUS":GOSUB 3150:PLOT 114,175:Message$="BEFORE THE TIMER RUNS OUT":GOSUB 3150
1600 FOR A=1 TO 100 STEP 5:FOR A1=A+10 TO A STEP -1:SOUND 1,A+A1*2,2:SOUND 4,A1*2-A*2+2,2:SOUND 2,211-A-A1,2:INK 14,RND*26:NEXT A1,A:FOR A=100 TO 1 STEP -5:FOR A1=A TO A+10:SOUND 1,A+A1*2,2:SOUND 4,A1*2-A*2+2,2:SOUND 2,211-A-A1,2:INK 14,RND*26:NEXT A1,A
1610 POKE 36035,80:A5=l:np1=l+5:IF NP1>10 THEN NP1=10:GOSUB 2050 ELSE GOSUB 2050
1620 A1$=" "+CHR$(245)+CHR$(246):FOR Y=8 TO 15:FOR X=1 TO 18:SOUND 2,Y*18+X-100,2:SOUND 5,350-(Y*18+X-100),2:LOCATE X,Y:PRINT A1$;:NEXT:LOCATE 19,Y:PRINT "  ";:NEXT
1630 POKE 36000,32:POKE 36001,1:POKE 36002,34:POKE 36003,1:FOR a=36004 TO 36020:POKE a,0:NEXT:POKE 36016,8
1640 PLOT 4,60,0:DRAWR 632,0
1650 LOCATE 1,1:PRINT SPACE$(20);:PLOT 8,396,8:Message$="LEVEL:"+STR$(L)+" HELICOPTERS:"+STR$(NH)+" SCORE:"+STR$(S):GOSUB 3150
1660 EI:EVERY 25-NP1,1 GOSUB 1990:EVERY 11,2 GOSUB 1900:EVERY 8,3 GOSUB 1860
1670 IF PEEK(36010)=0 AND PEEK(36011)=0 AND TX>89 THEN 1670
1680 DI:FOR A=0 TO 3:DD=REMAIN(A):NEXT
1690 IF TX<89 OR PEEK(36010)>0 THEN 2000
1700 GOSUB 3000:IF (Y>64 AND Y<306) THEN POKE 36011,0:GOTO 1660 ELSE IF (Y<65 AND UD=1) OR (Y>305 AND UD=2) THEN POKE 36011,0:GOTO 1660
1710 IF SCT(UD,(INT(X*3/640)+1))=1 THEN POKE 36011,0:GOTO 1660
1720 IF UD=1 THEN UD=2:INK 2,9,21:INK 1,6 ELSE UD=1:INK 2,6:INK 1,9,21
1730 GOSUB 1910
1740 IF x<240 OR x>400 THEN 1810 ELSE IF y<200 THEN 1780
1750 a11=INT(RND*5)-1:IF a11=-1 AND nh<2 THEN a11=1 ELSE IF a11=0 THEN a11=1
1760 nh=nh+a11:IF a11=-1 THEN q1$=" LOSE A HELICOPTER" ELSE Q1$=" WIN"+STR$(A11)+" HELICOPTERS"
1770 GOTO 1830
1780 IF RND<0.5 THEN A11=RND*10-3 ELSE A11=RND*6-2
1790 A11=INT(A11):IF L+A11<1 THEN A11=-L+1
1800 Q1$=" SKIP"+STR$(A11)+" LEVELS":L=L+A11:GOTO 1830
1810 a11=1000-5000*(RND>0.8):a11=INT(RND*a11-a11/4):IF s+a11<0 THEN a11=-s
1820 S=S+A11:Q1$=" WIN"+STR$(A11)+" POINTS"
1830 INK 14,21:PLOT 80,286,14:Message$="WELL DONE ! YOU"+Q1$:GOSUB 3150
1840 FOR A1=1 TO 20 STEP 2:FOR A=A1 TO A1+20 STEP 2:SOUND 1,A*2,2:SOUND 2,45-A,2:SOUND 4,A*4,2:INK 14,RND*26:NEXT A,A1:SOUND 1,A*2,20:SOUND 2,45-A,20:SOUND 4,A*4,20
1850 LOCATE 3,8:PRINT"                 ":IF SCT(1,1)+SCT(1,2)+SCT(1,3)+SCT(2,1)+SCT(2,2)+SCT(2,3)=6 THEN 1870 ELSE POKE 36011,0:GOTO 1650
1860 CALL 37000:RETURN
1870 INK 14,21:PLOT 80,200,14:Message$="WELL DONE ! YOU HAVE FINISHED":GOSUB 3150
1880 PLOT 80,150:Message$="YOU WIN AN EXTRA 10000 POINTS":GOSUB 3150
1890 S=S+10000:FOR A=1 TO 100:SOUND 1,ABS(A-100),2:SOUND 2,ABS(A-50),2:SOUND 4,ABS(A),2:INK 14,A MOD 15:FOR T=1 TO 4:NEXT T,A:GOTO 2020
1900 CALL 38000:RETURN
1910 INK 4,6:IF Y<200 THEN 1950
1920 IF X<240 THEN SCT(1,1)=1:PLOT 56,350:TAG:PRINT"    ";:TAGOFF:PLOT 76,350,4:GOTO 1980
1930 IF X<420 THEN SCT(1,2)=1:PLOT 230,350:TAG:PRINT"       ";:TAGOFF:PLOT 300,350,4:GOTO 1980
1940 sct(1,3)=1:PLOT 480,350:TAG:PRINT"    ";:TAGOFF:PLOT 510,350,4:GOTO 1980
1950 IF X<240 THEN SCT(2,1)=1:PLOT 56,18:TAG:PRINT"    ";:TAGOFF:PLOT 76,18,4:GOTO 1980
1960 IF X<420 THEN SCT(2,2)=1:PLOT 230,18:TAG:PRINT"       ";:TAGOFF:PLOT 300,18,4:GOTO 1980
1970 sct(2,3)=1:PLOT 480,18:TAG:PRINT"    ";:TAGOFF:PLOT 510,18,4:GOTO 1980
1980 Message$="USED":GOTO 3150
1990 DI:PLOT tx,364,3:DRAWR 0,12:tx=tx-4:EI:RETURN
2000 GOSUB 3000:X=X+32:Y=Y-8:FOR R=5 TO 450 STEP 8:C=RND*15:PLOT X-R,Y-R,C:PLOT X-R,Y:PLOT X-R,Y+R:PLOT X,Y-R:PLOT X,Y+R:PLOT X+R,Y-R:PLOT X+R,Y:PLOT X+R,Y+R:SOUND 5,451-R,2:SOUND 2,46-R/10,2:NEXT
2010 FOR R=5 TO 450 STEP 8:C=0:PLOT X-R,Y-R,C:PLOT X-R,Y:PLOT X-R,Y+R:PLOT X,Y-R:PLOT X,Y+R:PLOT X+R,Y-R:PLOT X+R,Y:PLOT X+R,Y+R:SOUND 5,R,2:SOUND 2,46+R/10,2:NEXT
2020 FOR Y=0 TO 404 STEP 2:PLOT 0,Y,6:DRAWR 640,0:PLOT 0,Y-6,5:DRAWR 640,0:SOUND 2,Y,2:SOUND 5,410-Y,2:NEXT:GOTO 1260
2030 ' *** SET UP OTHER HELICOPTERS ***
2040 np1=INT(l/(-(L<5)*2-(L>4)*3))+1:IF np1>10 THEN np1=10
2050 a2=PEEK(36035):FOR a=38300 TO 39000:POKE a,0:NEXT:POKE 36035,a2:POKE 38300,np1:FOR a=0 TO np1
2060 POKE 38336+a*50,RND*10+3:IF RND>0.5 THEN POKE 38330+a*50,l+RND*l+1:POKE 38337+a*50,253 ELSE POKE 38330+a*50,255-l-RND*l:POKE 38331+a*50,255:POKE 38337+a*50,252
2070 x9=RND*600+20:POKE 38326+a*50,x9 MOD 255:POKE 38327+a*50,INT(x9/255)
2080 IF RND>0.5 THEN POKE 38332+a*50,l+RND*3 ELSE POKE 38332+a*50,255-l-RND*3:POKE 38333+a*50,255:POKE 38334+a*50,1
2090 POKE 38335+a*50,a2:POKE 38328+a*50,a2+(255-a2)*RND:NEXT:RETURN
2100 DATA 0,24,6,7,8,11,16,21,23,26,26,24,15,18,26,20
2110 ' ***  18  DOCKING  PLATFORMS  ***
2120 FOR a=298 TO 290 STEP -2:PLOT 200,a,12:DRAWR 350,0:NEXT a:GOTO 2310
2130 FOR a=298 TO 290 STEP -2:PLOT 180,a,12:DRAWR 250,0:NEXT a:GOTO 2310
2140 FOR a=180 TO 580 STEP 175:FOR bb=298 TO 290 STEP -2:PLOT a,bb,12:DRAWR
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    90,0:NEXT bb,a:GOTO 2310
2150 FOR a=298 TO 290 STEP -2:PLOT 260,a
    ,12:DRAWR 130,0:NEXT a:GOTO 2310
2160 FOR a=1 TO 5:FOR bb=298 TO 290 STEP
     -2:PLOT 130+a*70,bb+(a-1)*22,12:DR
    AWR 64,0:NEXT bb,a:GOTO 2310
2170 FOR bb=0 TO 1:FOR a=298 TO 290 STEP
     -2:PLOT 200,a+bb*70,12:DRAWR 250,0
    :NEXT a,bb:GOTO 2310
2180 FOR a=298 TO 290 STEP -2:PLOT 0,a,1
    2:DRAWR 380,0:PLOT 470,a:DRAWR 170,
    0:NEXT a:FOR a=358 TO 350 STEP -2:P
    LOT 300,a:DRAWR 270,0:NEXT a:GOTO 2
    310
2190 FOR a=388 TO 380 STEP -2:PLOT 180,a
    ,12:DRAWR 400,0:NEXT a:FOR a=308 TO
     300 STEP -2:PLOT 280,a,12:DRAWR 13
    0,0:NEXT a:GOTO 2310
2200 FOR a=298 TO 290 STEP -2:PLOT 200,a
    ,12:DRAWR 150,0:MOVER 75,0:DRAWR 15
    0,0:PLOT 200,a+100:DRAWR 375,0:NEXT
     a:FOR a=200 TO 208 STEP 2:PLOT a,2
    98,12:DRAWR 0,100:PLOT a+367,298:DR
    AWR 0,100:NEXT a:GOTO 2310
2210 FOR a=298 TO 290 STEP -2:PLOT 230,a
    ,12:DRAWR 130,0:MOVER 75,0:DRAWR 13
    0,0:PLOT 230,a+100:DRAWR 335,0:NEXT
     a:FOR a=230 TO 238 STEP 2:PLOT a,2
    98,12:DRAWR 0,100:PLOT a+327,298:DR
    AWR 0,100:NEXT a:GOTO 2310
2220 FOR a=298 TO 290 STEP -2:PLOT 260,a
    ,12:DRAWR 100,0:MOVER 75,0:DRAWR 10
    0,0:PLOT 260,a+98:DRAWR 275,0:NEXT
    a:FOR a=260 TO 268 STEP 2:PLOT a,29
    3,12:DRAWR 0,95:PLOT a+267,293:DRAW
    R 0,100:NEXT a:GOTO 2310
2230 FOR a=298 TO 290 STEP -2:FOR bb=0 T
    O 590 STEP 60:PLOT bb,a,12:DRAWR 30
    ,0:NEXT bb,a:GOTO 2310
2240 FOR a=298 TO 290 STEP -2:PLOT 260,a
    ,12:DRAWR 275,0:NEXT a:FOR a=260 TO
     268 STEP 2:PLOT a,293,12:DRAWR 0,7
    5:PLOT a+267,293:DRAWR 0,75:NEXT a:
    GOTO 2310
2250 FOR a=298 TO 290 STEP -2:PLOT 260,a
    ,12:DRAWR 225,0:NEXT a:FOR a=260 TO
     268 STEP 2:PLOT a,293,12:DRAWR 0,1
    04:PLOT a+217,293:DRAWR 0,104:NEXT
    a:GOTO 2310
2260 FOR bb=32 TO 1 STEP -1:FOR a=410-bb
    *6 TO 402-bb*6 STEP -2:PLOT bb*30,a
    ,12:DRAWR 28,0:NEXT a,bb:GOTO 2310
2270 FOR a=200 TO 208 STEP 2:FOR bb=a TO
     a+450 STEP 140:PLOT bb,290,12:DRAW
    R 0,106:NEXT bb,a:FOR a=298 TO 290
    STEP -2:PLOT 420,a:DRAWR 130,0:PLOT
     420,a+98:DRAWR 130,0:NEXT a:FOR a=
    350 TO 358 STEP 2:PLOT 200,a:DRAWR
    150,0:NEXT a
2280 FOR a=620 TO 628:PLOT a,310,0:DRAWR
     0,20:NEXT a:GOTO 2310
2290 FOR bb=200 TO 500 STEP 68:FOR a=300
     TO 308 STEP 2:PLOT bb,a,12:DRAWR 3
    0,0:MOVER 2,-16:DRAWR 32,0:NEXT a,b
    b:GOTO 2310
2300 FOR a=410 TO 620 STEP 96:FOR a1=0 T
    O 6:FOR a2=70+a/2 TO 78+a/2 STEP 2:
    PLOT a/3+a1*64+90,a2,12:DRAWR 32,0:
    NEXT a2,a1,a:GOTO 2310
2310 PRINT CHR$(22)+CHR$(1);:PLOT 0,352,
    15:DRAWR 114,0:FOR y=350 TO 340 STE
    P -2:PLOT 0,y,10:DRAWR 114,0:NEXT:P
    EN 7:LOCATE 1,4:PRINT heli$;:PRINT
    CHR$(22)+CHR$(0);:RETURN
2320 INK 1,16:FOR x=0 TO 640 STEP 8:PLOT
     x,0,1:DRAW x,400,1:PLOT 644-x,0,1:
    DRAW 644-x,400,1:SOUND 4,x,1:SOUND
    1,642-x,1:NEXT
2330 INK 0,16:CLS:INK 1,21,14:PEN 1:g$="
    GAME  OVER":g1$="           ":FOR a=
    1 TO 13:LOCATE 6,a:PRINT g$:LOCATE
    6,26-a:PRINT g$:SOUND 2,a,1:NEXT:FO
    R a=1 TO 12:LOCATE 6,a:PRINT g1$:LO
    CATE 6,26-a:PRINT g1$:SOUND 2,15-a,
    1:NEXT
2340 LOCATE 6,13:FOR a=1 TO 10:INK a+3,2
    6:PEN a+3:PRINT MID$(g$,a,1);:NEXT
    a:RESTORE 2960:FOR a=1 TO 12:READ c
    (a):NEXT a:c=1:FOR a3=1 TO 50:b=15:
    FOR a=c TO 12:INK b,c(a):b=b-1:NEXT
    :FOR a=1 TO c-1:INK b,c(a):b=b-1:NE
    XT:c=c+1:IF c>12 THEN c=1
2350 SOUND 2,a3*c,1:NEXT:RUN 50
2360 ' ***  I N S T R U C T I O N S ***
2370 MODE 1:INK 0,22:BORDER 22:INK 1,11:
    INK 2,7:PEN 2:LOCATE 13,3:PRINT"* I
    nstructions *":LOCATE 13,2:PRINT ST
    RING$(16,"*");:LOCATE 13,4:PRINT ST
    RING$(16,"*");
2380 PEN 1:LOCATE 4,6:PRINT"You Are Pilo
    ting A Helicopter Flying";:PRINT"Ov
    er New York. In The Basement Of Eve
    ry Building Is A Crate Of Gold, To
     Expose"
2390 PRINT"The Crates You Have To Blow U
    p The Sky- scraper. When It Is Dest
    royed The Crate Will Be Left On The
     Site Where The Sky- scraper Was.
    When It Is Clear To Hover Over A Cr
    ate You May Winch One Up Below You
    (By Pressing The FIRE Button). Your
    ";
2400 PRINT"Job Is Now To Carry The Crate
     Up To The Main Docking Platform Wh
    ere You Can Put It Down ( Using The
     FIRE Button Again.)";
2410 PRINT"To Finish A Screen You Must H
    ave All 20 Crates On The Platform.
    You May Have To Stack The Crates In
     Order To Get All Of Them On.There
    Is One Other Way That You May Compl
    ete A Screen But You Must Find This
     Yourself !"
2420 INK 3,15,26:PEN 3:GOTO 2940
2430 CLS:INK 0,0:INK 1,14:PEN 1:BORDER 1
    8:LOCATE 17,2:PRINT"Hints":INK 2,17
    :PEN 2:LOCATE 5,4:PRINT"Your Helico
    pter Has Momentum - Once":PRINT" Yo
    u Set It In Motion It Continues Wit
    h  That Motion.To Stop It You Rever
    se The  Original Movement.";
2440 PRINT"It Is Possible To Go":PRINT"
    Above The Top Of The Screen But Bew
    are  That You Do Not Lose Track Of
    Your Own  Position Otherwise You Ma
    y Go Too High  ( And Run Out Of Oxy
    gen ) Or Come Down  Too Fast And Cr
    ash Into Something. Try"
2450 PRINT" And Land When There Is A Spe
    cial Bonus  On The Screen. Try And
    Watch The Other  Helicopter Since Y
    ou Can Easily Hit It"
2460 PRINT" You Are Only Allowed To Land
     Ten Times  So Use Them Wisely.As Y
    ou Progress The  Cargo Bays Change
    Shape So Try To Drop  Your Crates C
    arefully Ensuring That 20  Crates M
    ay All Be Easily Placed On The  Giv
    en Area Of The Cargo Bay."
2470 INK 3,15,26:PEN 3:GOTO 2940
2480 CLS:INK 0,26:BORDER 26:INK 1,0:PEN
    1:LOCATE 17,2:PRINT"WARNINGS":LOCAT
    E 16,3:PRINT"==========":INK 2,8:PE
    N 2:LOCATE 12,5:PRINT "Do Not Fly T
    oo High":LOCATE 4,6:PRINT"Your Engi
    ne Will Run Out Of Oxygen."
2490 LOCATE 10,8:PRINT"You Cannot Bomb T
    oo High":LOCATE 5,9:PRINT"You Would
     Depresurize To Quickly."
2500 LOCATE 10,11:PRINT"You Cannot Bomb
    Too Low":LOCATE 8,12:PRINT"You Woul
    d Blow Yourself Up."
2510 LOCATE 11,14:PRINT"Do Not Touch Any
    thing":LOCATE 2,15:PRINT"Any Contac
    t Will Crash Your Helicopter.";
2520 LOCATE 14,17:PRINT"Watch Your Fuel"
    :LOCATE 2,18:PRINT"You Cannot Land
    Carrying A Crate:Ensure";:PRINT" Yo
    u Have Enough Fuel Before Lifting O
    ne";
2530 LOCATE 11,21:PRINT"Watch Your Own B
    ombs":LOCATE 4,22:PRINT"It Is Possi
    ble To Blow Yourself Up.";
2540 INK 3,16,18:PEN 3:GOTO 2940
2550 BORDER 16:INK 0,11:INK 1,26:PEN 1:C
    LS:LOCATE 18,1:PRINT"Controls":LOCA
    TE 17,2:PRINT"==========";
2560 LOCATE 8,4:PRINT"Joystick
     Fire Button";:LOCATE 7,5:PRINT"===
    =======          =============";
2570 INK 2,0:PEN 2:LOCATE 24,7:PRINT"It
    Does 4 Things:";:LOCATE 24,9:PRINT"
    a) It Drops Bombs";:LOCATE 24,11:PR
    INT"b) It  Picks   Up";:LOCATE 24,1
    2:PRINT"Crates If You Are";:LOCATE
    24,13:PRINT"Correctly Placed,";
2580 LOCATE 24,15:PRINT"c) It  Places
    a";:LOCATE 24,16:PRINT"Crate On The
     Main";:LOCATE 24,17:PRINT"Docking
    Platform,";
2590 LOCATE 24,19:PRINT"d) It  Cuts   Th
    e";:LOCATE 24,20:PRINT"Engines  So
     That";:LOCATE 24,21:PRINT"The Land
    ing Crews":LOCATE 24,22:PRINT"May
    Refuel  Your";:LOCATE 24,23:PRINT"H
    elicopter.";
2600 PEN 1:ORIGIN 0,0:PLOT 75,150,1:DRAW
    R 200,0:MOVER -100,-100:DRAWR 0,200
    :MOVER 75,-25:DRAWR -150,-150:MOVER
     150,0:DRAWR -150,150
2610 c$=CHR$(158)+CHR$(159):LOCATE 11,16
    :PRINT c$;:LOCATE 6,10:PRINT c$;
2620 INK 3,6:PEN 3:LOCATE 11,9:PRINT"Up"
    ;:LOCATE 10,23:PRINT"Down";:LOCATE
    1,16:PRINT"Slow";:LOCATE 19,16:PRIN
    T"Fast";
2630 LOCATE 2,10:PRINT"Fire";
2640 GOTO 2940
2650 CLS:INK 0,16:INK 1,24:INK 2,20:BORD
    ER 11:PEN 1:LOCATE 17,2:PRINT"Scori
    ng":LOCATE 16,3:PRINT"=========":LO
    CATE 13,5:PRINT"During A Screen"
2660 PEN 2:LOCATE 4,8:PRINT"Distroying A
     Building 75-300 Points":LOCATE 4,1
    0:PRINT"Picking Up A Crate        25
    0 Points":LOCATE 4,12:PRINT"Putting
     Down A Crate     500 Points"
2670 PEN 1:LOCATE 13,15:PRINT"After A Sc
    reen":PEN 2:LOCATE 4,18:PRINT"Each
    Unit Of Fuel Left     1 Point":LOCA
    TE 4,20:PRINT"Each Bomb Remaining
         20 Points":LOCATE 4,22:PRINT"E
    ach Unused Landing        50 Points"
2680 INK 3,26,7:PEN 3:GOTO 2940
2690 CLS:BORDER 18:INK 0,25:INK 1,7:PEN
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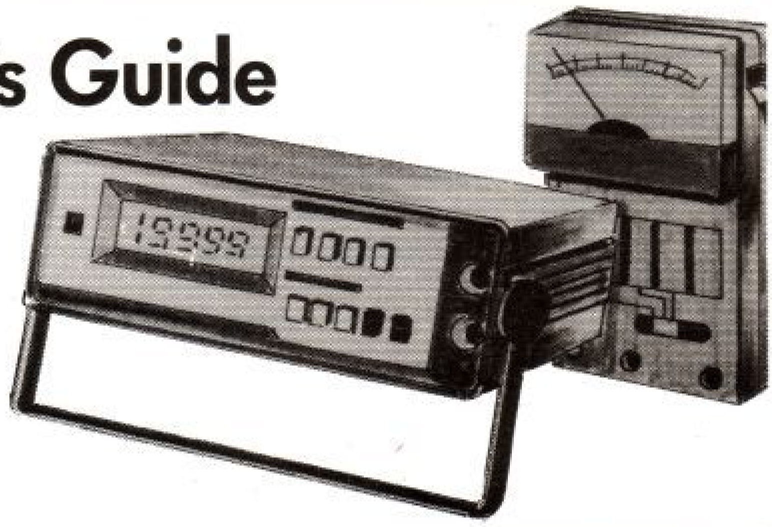
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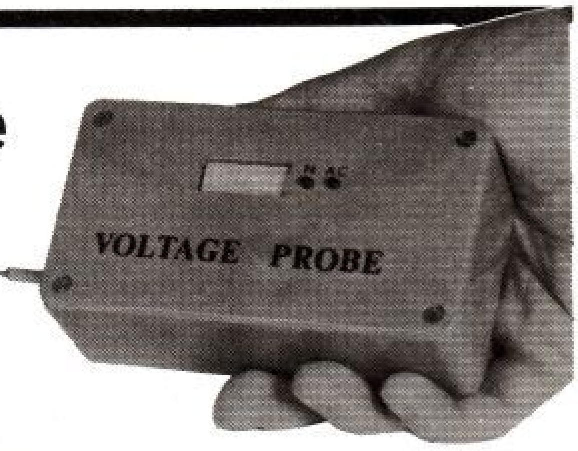
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Multimeter Buyer's Guide

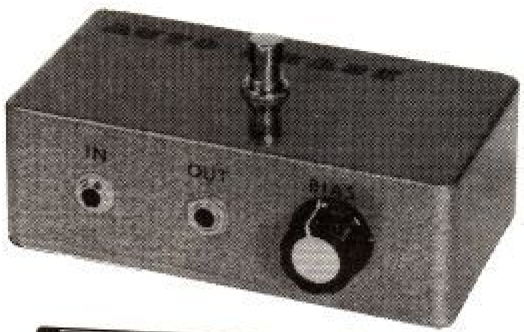


For most enthusiasts, the multimeter is their first major investment in serious electronic construction. This useful guide shows you how to get the most from your purchase.

Voltage Probe

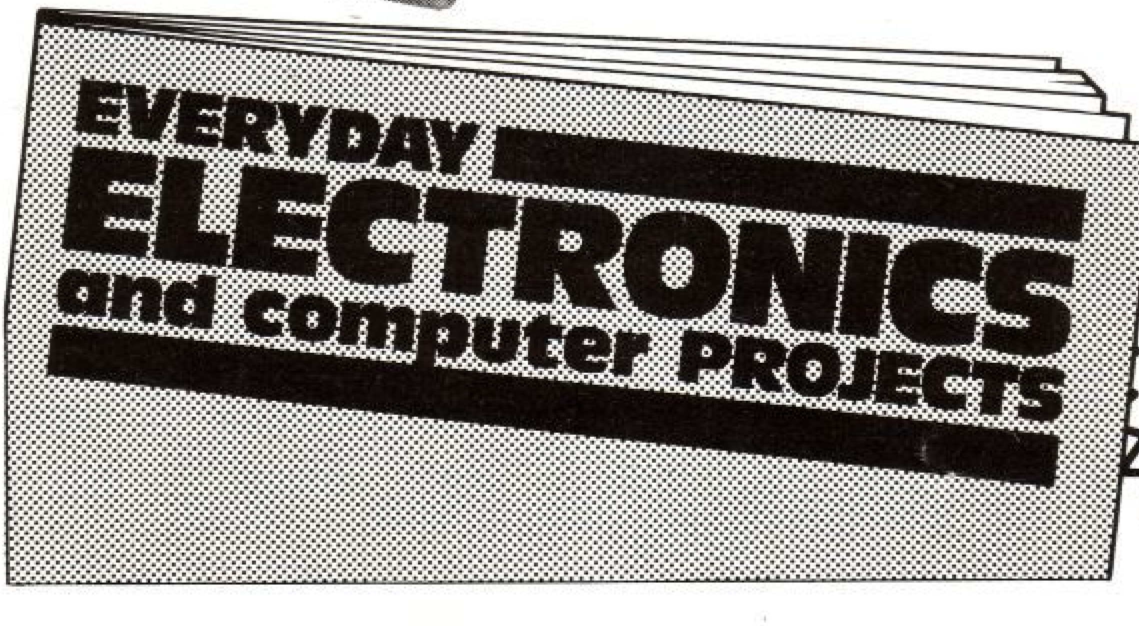


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```
    1:LOCATE 15,2:PRINT"Special Bonus":
    LOCATE 14,3:PRINT"===============":
    INK 2,11:PEN 2:LOCATE 4,5:PRINT"If
    You Land While A Special Bonus":PRI
    NT"     Symbol Is Flashing In The T
    op "
2700 PRINT"     Left Corner Of The Scree
    n You":PRINT"  Gain One Of The Foll
    owing Features:":INK 3,1:PEN 3:LOCA
    TE 6,11:PRINT"B   These Give You 10
    00 Points":PRINT"     O   Each And
    Are Added To Your":PRINT"     N   S
    pecial Bonus In The Botom"
2710 PRINT"     U   Right Of The Screen.
    Making":PRINT"     S   BONUS Wins O
    ne Helicopter.":LOCATE 6,17:PRINT C
    HR$(253);"   Wins One Extra Helicop
    ter.":LOCATE 6,19:PRINT k$;"   250
    Pts For Landed Crates."
2720 LOCATE 6,21:PRINT d$;"   Mystery Bo
    mbs, And Points.":LOCATE 6,23:PRINT
     CHR$(162);"   **** Mystery  Featur
    e ****"
2730 PEN 1:GOTO 2940
2740 CLS:INK 0,15:INK 1,14:BORDER 12:PEN
     1:LOCATE 13,2:PRINT"Game Modificat
    ion":PRINT:PRINT"   (Use Cursor Key
    s To Make Changes)":INK 2,21:PEN 2:
    LOCATE 4,8:PRINT"Number Of Helicopt
    ers At Start ";t(1)
2750 LOCATE 4,11:PRINT"Landed Crates To
    Finish Screen ";t(2):LOCATE 4,14:PR
    INT"Level On Which Game Will Begin
    ";t(3):LOCATE 4,17:PRINT"Maximum No
    .Of Landings Allowed ";t(4):LOCATE
    4,20:PRINT"The Frequency Of Special
     Bonus ";t(5)
2760 LOCATE 4,23:PRINT"Return To The Mai
    n Menu Screen ";t(6)
2770 y=1:x=35:INK 3,26:PEN 3:LOCATE x,y*
    3+5:PRINT t(1)
2780 IF INKEY(2)=0 AND y<>6 THEN PEN 2:L
    OCATE x,y*3+5:PRINT t(y):y=y+1:PEN
    3:LOCATE x,y*3+5:PRINT t(y):FOR t=1
     TO 50:NEXT t
2790 IF INKEY(0)=0 AND y<>1 THEN PEN 2:L
    OCATE x,y*3+5:PRINT t(y):y=y-1:PEN
    3:LOCATE x,y*3+5:PRINT t(y):FOR t=1
     TO 50:NEXT t
2800 d1=0:IF INKEY(8)=0 THEN d1=-1
2810 IF INKEY(1)=0 THEN d1=1
2820 IF d1=0 THEN 2780 ELSE ON y GOTO 28
    30,2850,2870,2890,2910,320
2830 t(y)=t(y)+d1:IF t(y)>9 THEN t(y)=9
    ELSE IF t(y)<1 THEN t(y)=1
2840 GOTO 2920
2850 t(y)=t(y)+d1:IF t(y)>20 THEN t(y)=2
    0 ELSE IF t(y)<10 THEN t(y)=10
2860 GOTO 2920
2870 t(y)=t(y)+d1:IF t(y)>9 THEN t(y)=9
    ELSE IF t(y)<1 THEN t(y)=1
2880 GOTO 2920
2890 t(y)=t(y)+d1:IF t(y)>15 THEN t(y)=1
    5 ELSE IF t(y)<2 THEN t(y)=2
2900 GOTO 2920
2910 t(y)=t(y)+d1*25:IF t(y)>2000 THEN t
    (y)=2000 ELSE IF t(y)<250 THEN t(y)
    =250
2920 LOCATE x,y*3+5:PRINT t(y):FOR t=1 T
    O 50:NEXT t:GOTO 2780
2930 RETURN
2940 LOCATE 4,25:PRINT"Press SPACE BAR T
    o Return To Menu"
2950 IF INKEY(47)<>0 THEN 2950 ELSE 320
2960 DATA 26,17,2,6,8,13,15,18,24,0,22,2
    0
2970 SOUND 4,200,8:SOUND 4,500,8:SOUND 4
    ,250,12:RETURN
2980 FOR a=1 TO 50:a$=INKEY$:NEXT:RETURN
2990 MODE 2:INK 0,26:INK 1,0:PEN 1
3000 DI:x=PEEK(36000)+PEEK(36001)*256:y=
    PEEK(36002)+PEEK(36003)*256:EI:IF x
    >1000 THEN x=-20:RETURN ELSE RETURN
3010 ' **********************************
3020 ' ***      FANCY    WRITING      ***
3030 ' **********************************
3040 ' * THIS SUB-ROUTINE CAN BE USED *
3050 ' * IN ANY PROGRAM TO GIVE A MAX *
3060 ' * OF 40 CHARACTERS ON A MODE 0 *
3070 ' * SCREEN.  THE STRING TO PRINT *
3080 ' * IS HELD IN <MESSAGE$> AND IT *
3090 ' * IS WRITEN USING THE GRAPHICS *
3100 ' * INK AT THE GRAPHICS POSITION *
3110 ' *  NOTE:  IT ONLY PRINTS UPPER *
3120 ' * CASE  CHARCTERS  AND  A  FEW *
3130 ' * OTHER CHARCTERS.              *
3140 ' **********************************
3150 FOR abg1=1 TO LEN(Message$):abg3=AS
    C(MID$(Message$,abg1,1)):IF abg3<32
     OR abg3>127 THEN 3260
3160 SOUND 2,abg3*2,2
3170 ON INT(abg3/16) GOTO 3260,3180,3200
    ,3220,3240
3180 abg4=abg3 MOD 16:ON abg4+1 GOSUB 32
    70,3300,3270,3270,3270,3270,3270,32
    70,3270,3270,3270,3270,3270,3290
3190 GOTO 3250
3200 abg4=abg3 MOD 16:ON abg4+1 GOSUB 33
    20,3330,3340,3350,3360,3370,3380,33
    90,3400,3410,3420
3210 GOTO 3250
3220 abg4=abg3 MOD 16:ON abg4+1 GOSUB 34
    30,3450,3460,3470,3480,3490,3500,35
    10,3520,3530,3540,3550,3560,3570,35
    80,3590
3230 GOTO 3250
3240 abg4=abg3 MOD 16:ON abg4+1 GOSUB 36
    00,3610,3620,3630,3640,3650,3660,36
    70,3680,3690,3700
3250 NEXT:RETURN
3260 NEXT:RETURN
3270 MOVER 16,0
3280 RETURN
3290 MOVER 0,-6:DRAWR 8,0:MOVER 8,6:RETU
    RN
3300 MOVER 8,0:DRAWR 0,-6:MOVER 0,-4:DRA
    WR 0,-2:MOVER 8,12:RETURN
3310 MOVER 0,-6:DRAWR 8,0:MOVER 8,6:RETU
    RN
3320 DRAWR 0,-12:DRAWR 8,0:DRAWR 0,12:DR
    AWR -8,0:MOVER 16,0:RETURN
3330 MOVER 4,0:DRAWR 0,-12:MOVER 12,12:R
    ETURN
3340 DRAWR 8,0:DRAWR 0,-6:DRAWR -8,0:DRA
    WR 0,-6:DRAWR 8,0:MOVER 8,12:RETURN
3350 DRAWR 8,0:DRAWR 0,-12:DRAWR -8,0:MO
    VER 0,6:DRAWR 8,0:MOVER 8,6:RETURN
3360 DRAWR 0,-6:DRAWR 8,0:MOVER 0,-6:DRA
    WR 0,12:MOVER 8,0:RETURN
3370 MOVER 8,0:DRAWR -8,0:DRAWR 0,-6:DRA
    WR 8,0:DRAWR 0,-6:DRAWR -8,0:MOVER
    16,12:RETURN
3380 MOVER 8,0:DRAWR -8,0:DRAWR 0,-12:DR
    AWR 8,0:DRAWR 0,6:DRAWR -8,0:MOVER
    16,6:RETURN
3390 DRAWR 8,0:DRAWR -4,-12:MOVER 12,12:
    RETURN
3400 DRAWR 0,-12:DRAWR 8,0:DRAWR 0,12:DR
    AWR -8,0:PLOTR 4,-6:MOVER 12,6:RETU
    RN
3410 MOVER 0,-12:DRAWR 8,0:DRAWR 0,12:DR
    AWR -8,0:DRAWR 0,-6:DRAWR 8,0:MOVER
     8,6:RETURN
3420 MOVER 4,-2:DRAWR 0,-2:MOVER 0,-4:DR
    AWR 0,-2:MOVER 12,10:RETURN
3430 PRINT"a"
3440 RETURN
3450 DRAWR 0,-12:MOVER 0,12:DRAWR 8,0:DR
    AWR 0,-12:MOVER 0,6:DRAWR -8,0:MOVE
    R 16,6:RETURN
3460 DRAWR 0,-12:DRAWR 8,0:DRAWR 0,12:DR
    AWR -8,0:MOVER 0,-6:DRAWR 8,0:MOVER
     8,6:RETURN
3470 DRAWR 0,-12:DRAWR 8,0:MOVER 0,12:DR
    AWR -8,0:MOVER 16,0:RETURN
3480 DRAWR 0,-12:DRAWR 4,0:MOVER 4,2:DRA
    WR 0,8:MOVER -4,2:DRAWR -4,0:MOVER
    16,0:RETURN
3490 DRAWR 0,-12:DRAWR 8,0:MOVER -4,6:DR
    AWR -4,0:MOVER 0,6:DRAWR 8,0:MOVER
    8,0:RETURN
3500 DRAWR 0,-12:MOVER 4,6:DRAWR -4,0:MO
    VER 0,6:DRAWR 8,0:MOVER 8,0:RETURN
3510 MOVER 4,0:DRAWR 4,0:MOVER -8,-2:DRA
    WR 0,-8:MOVER 4,-2:DRAWR 4,0:DRAWR
    0,4:MOVER 8,8:RETURN
3520 DRAWR 0,-12:MOVER 0,6:DRAWR 8,0:DRA
    WR 0,-6:DRAWR 0,12:MOVER 8,0:RETURN
3530 DRAWR 8,0:MOVER -4,0:DRAWR 0,-12:DR
    AWR -4,0:DRAWR 8,0:MOVER 8,12:RETUR
    N
3540 DRAWR 8,0:DRAWR 0,-10:DRAWR -4,-2:D
    RAWR -4,2:MOVER 16,10:RETURN
3550 DRAWR 0,-12:MOVER 8,0:DRAWR -8,6:DR
    AWR 8,6:MOVER 8,0:RETURN
3560 DRAWR 0,-12:DRAWR 8,0:MOVER 8,12:RE
    TURN
3570 DRAWR 0,-12:MOVER 0,8:DRAWR 8,4:DRA
    WR 0,-12:MOVER 8,12:RETURN
3580 MOVER 0,-12:DRAWR 0,12:DRAWR 8,0:DR
    AWR 0,-12:MOVER 8,12:RETURN
3590 MOVER 8,-2:DRAWR 0,-8:DRAWR -4,-2:D
    RAWR -4,2:DRAWR 0,8:PLOTR 4,2:MOVER
     12,0:RETURN
3600 MOVER 0,-12:DRAWR 0,12:DRAWR 8,0:DR
    AWR 0,-6:DRAWR -8,0:MOVER 16,6:RETU
    RN
3610 MOVER 8,-2:DRAWR 0,-8:DRAWR -4,-2:D
    RAWR -4,2:DRAWR 0,8:PLOTR 4,2:MOVER
     0,-8:DRAWR 4,-4:MOVER 8,12:RETURN
3620 MOVER 0,-12:DRAWR 0,12:DRAWR 4,0:DR
    AWR 4,-4:DRAWR -4,-4:DRAWR -4,0:DRA
    WR 8,-4:MOVER 8,12:RETURN
3630 PLOTR 8,-2:PLOTR -4,2:PLOTR -4,-2:P
    LOTR 0,-2:PLOTR 4,-2:PLOTR 4,-2:PLO
    TR 0,-2:PLOTR -4,-2:PLOTR -4,2:MOVE
    R 16,10:RETURN
3640 DRAWR 8,0:MOVER -4,0:DRAWR 0,-12:MO
    VER 12,12:RETURN
3650 DRAWR 0,-12:DRAWR 8,0:DRAWR 0,12:MO
    VER 8,0:RETURN
3660 DRAWR 0,-8:PLOTR 4,-2:PLOTR 0,-2:MO
    VER 4,4:DRAWR 0,8:MOVER 8,0:RETURN
3670 DRAWR 0,-12:PLOTR 4,2:MOVER 4,-2:DR
    AWR 0,12:MOVER 8,0:RETURN
3680 DRAWR 0,-2:MOVER 4,-2:DRAWR 0,-4:MO
    VER -4,-2:DRAWR 0,-2:MOVER 8,0:DRAW
    R 0,2:MOVER 0,8:DRAWR 0,2:MOVER 8,0
    :RETURN
3690 DRAWR 0,-4:MOVER 4,-2:DRAWR 0,-6:MO
    VER 4,8:DRAWR 0,4:MOVER 8,0:RETURN
3700 DRAWR 8,0:PLOTR 0,-2:MOVER -4,-2:DR
    AWR 0,-4:PLOTR -4,-2:MOVER 0,-2:DRA
    WR 8,0:MOVER 8,12:RETURN
3710 ' ***      LONG  ISN'T it???     ***
```

Using 5 $^1/_4$ inch discs

Lots of people ask about adding 5 $^1/_4$ inch discs. David Robinson looks at the pitfalls.

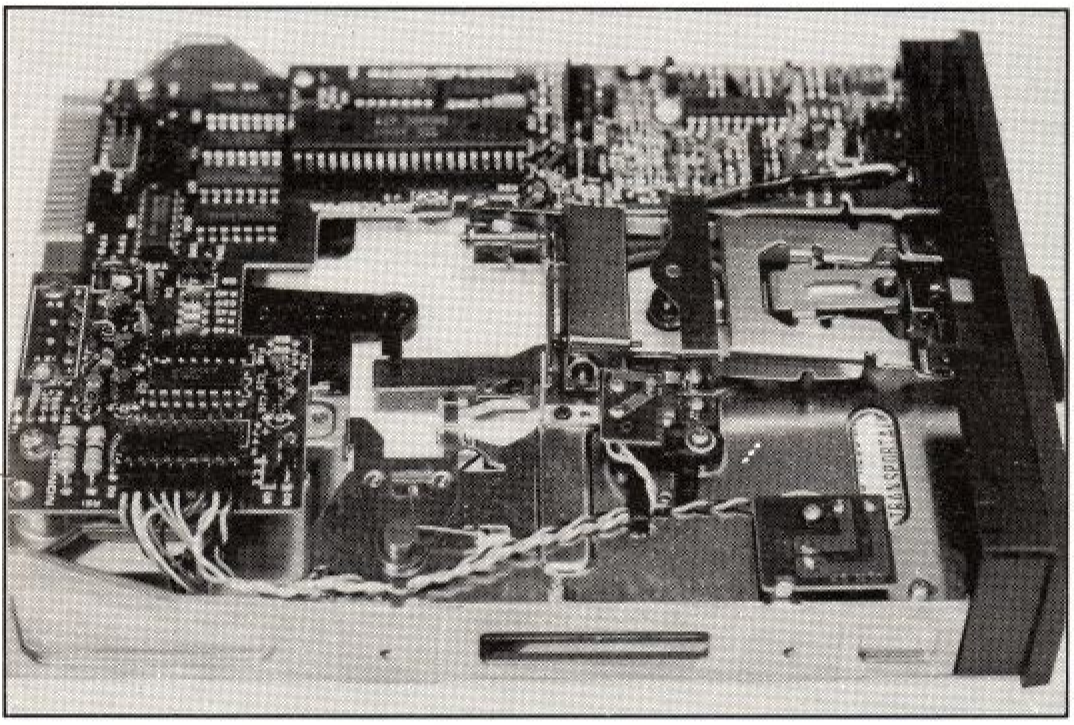
At the beginning of November we had a really BIG problem. Having spent three months developing disc based software for ARNOLD's new disc drive we had to transfer the programs across from our development system onto an ARNOLD with disc.

The classic way to do this is via an RS232 standard interface, we have one of these on the development system and someone lent us a custom made RS232 board to plug into the CPC464. Of course the RS232 standard is anything but a standard, and to cut a VERY long story short, we gave up the attempt before we lost our sanity.

However, the problem was now pretty desperate. Three months work laying in repose on a TELEVIDEO 5 $^1/_4$ inch floppy disc when it was needed urgently on a 3 inch AMSTRAD disc, and no way of bridging the gap.

Digging about in the AMSTRAD DISC DRIVE FIRMWARE MANUAL, I found some brief details of how to use a 5 $^1/_4$ inch drive as drive B. What follows is the story of how we made the link up and a few tips (as well as a few warnings) to any of you who have a need to use the larger format discs.

First of all though, some WARNING words and considerations to be carefully thought through before you undertake this operation:



CHINON F 051-MD 5 $^1/_4$ inch floppy disc drive

1. Do you REALLY need 5 $^1/_4$ inch discs? Unless you have a specific need, there are NO advantages over the standard AMSTRAD drives, and because there are over 100 different disc formats within the 5 $^1/_4$ inch size, it is very unlikely that any programs on a given 5 $^1/_4$ inch disc will run on an ARNOLD unless specifically designed to do so. This means that the quote, '....and of course, CP/M means you can choose from thousands of programs....' is not quite true!

2. Although 5 $^1/_4$ inch discs are about half the price of 3 inch discs the 3 inch ones are usable both sides -so the cost per kilobyte stored is just the same.

3. Are you any good at soldering? You will need to be!

4. Can you afford it? The cost of a 5 $^1/_4$ inch set-up is going to add up to more than buying a new AMSTRAD 3 inch drive.

The message is that if you are an average user, then there will be no benefit to you if you add a 5 $^1/_4$ inch drive to your system. However, there will still be users who, for a variety of reasons, need to use one of the larger drives. If you are one of those people, then in the remainder of this article I will reveal all you need to know to complete the job successfully. From here on I will assume that you already have an AMSTRAD 3 inch drive and interface/controller, and will use the 5 $^1/_4$ inch drive as drive B.

The first major consideration is the choice of drive unit. The drive MUST have a READY signal on pin 34, and have suitable step rate, motor on & off timeout. In practice this means using a CHINON F051-MD 5 $^1/_4$ inch drive which is normally only available as an OEM unit. (i.e. to the trade). You can't use just any old unit and I promise you that any attempt to link up a SHUGART drive, or one borrowed from your friend's BBC or something, is doomed to failure because the connections simply aren't right.

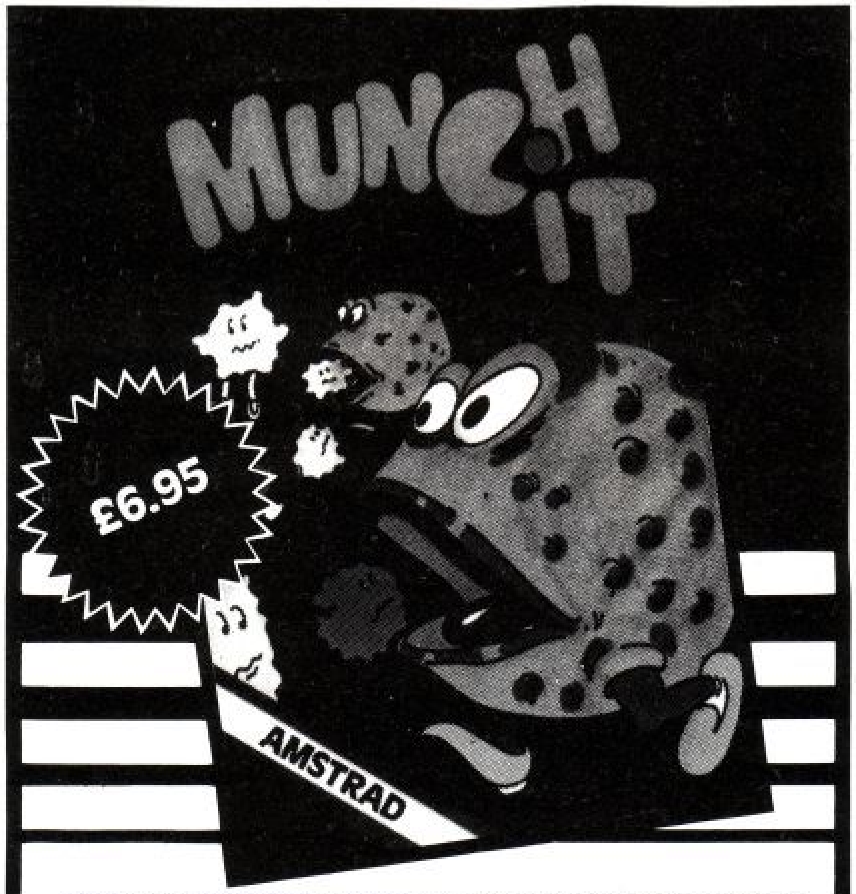
If you use the recommended drive all will be well. The CHINON is also very well made with a proper cast chassis, not a tatty pressed one, which is probably why the price (for one only) was £157 including VAT but no case and no power supply.

The next purchase is a power supply providing 12V 5V and GROUND via a four pin connector arranged 12V/G/G/5V. A list of all the suppliers that we used is at the foot of this article.

Finally you need a way of connecting the ribbon cable from the disc controller to your new disc drive. You need 2 items here - a 34 way card edge connector plus a 40 pin PCB header which you convert to 34 ways by cutting off three pairs of pins from one end . Remove the ribbon cable clamp from the card edge connector then carefully solder the SHORTER of the



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```
10 MEMORY HIMEM-10
20 start=HIMEM+1
30 :ASSEMBLE,start
40 'get start
50 'limit &FFFF
60 'ORG start
70 'CP 10:SCF:RET Z
80 'RST 1,&8752
90 'ORG &BD2B
100'JP start
110'END
```

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pins to the terminals on the back. You may need to bend the pins outwards a little so that the spacing is correct. If you intend to unplug this connector quite a lot you should strengthen the joint with say, Araldite after checking all the soldered connections for continuity.

You will also need to provide some physical means of supporting the AMSTRAD drive in piggy back fashion above the 5 $^1/_4$ inch drive because the ribbon cable is not long enough to allow the drives to stand side by side. We used a bridge made from plastic covered chipboard as a temporary solution until a proper case could be made up. Don't try extending the ribbon cable, as cable length is critical to the electronics.

ASSEMBLY

Ensuring that the power is disconnected, plug the power supply into the socket at the rear of the disc drive chassis. The ribbon cable from the disc controller has two connectors on it. The one at the END should be reserved for the 3 INCH DRIVE. Plug the pins of your home made connector into the other connector on the ribbon cable.

Next push the card edge connector onto the printed circuit board at the back of the CHINON drive as shown in Photo 1. Immediately in front of the connector now should be a small component with 10 small spikes in 2 rows of five. This controls which drive number the disc drive thinks it is. Move the small connecting bridge from the pin pair marked 1 to the pin pair marked 2 so that our drive knows that it's supposed to be drive B. Immediately forward from this drive selection bank is a terminal resistor marked BECKMANN 899-3-R150 white plastic & black lettering. CAREFULLY remove this component from its socket - it won't be needed so long as our 5 $^1/_4$ inch disc is drive B.

Plug the 3 inch AMSTRAD drive onto the interface ribbon cable and plug the interface into your computer.

It's time to switch on now, so make sure that you do it in the correct order -disc drives first then the computer. Put your CP/M master disc in drive A (the 3 inch one) and a blank 5 $^1/_4$ inch disc in drive B. You can test the new configuration by entering CP/M and using COPYDISC to copy any 3 inch CP/M disc to a 5 $^1/_4$ inch. Verify that the files have transferred across by typing DIR B: which will list the files on your 5 $^1/_4$ inch disc.

SOFTWARE CONSIDERATIONS. The CP/M systems utility programs supplied have all been set up so that -

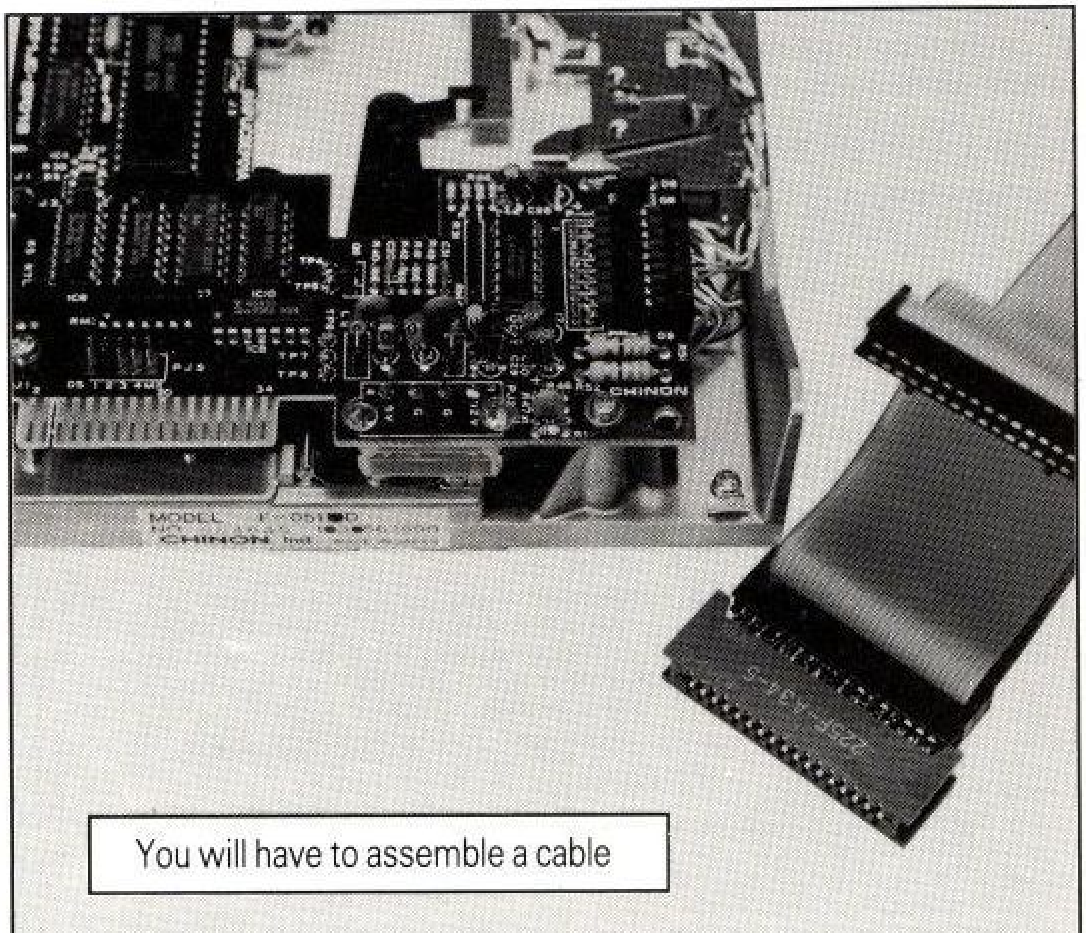
1. You can't format a disc on drive B:
2. You can't directly copy a disc from drive B: to drive A: If your experience of CP/M is limited then you will probably be keen to know that there are ways round this -

1. Copy a blank FORMATTED 3 inch disc to drive B: using COPYDISC This program will format the tracks onto the 5 $^1/_4$ inch disc as it copies.
2. To copy from drive B: to drive A: use PIP as follows:

PIP A:=B:*.*

Please note that the PIP.COM program must also be present on the active drive when you copy in this way.

To sum up, if you really need to have a 5 $^1/_4$ inch disc on your CPC464 then the procedure I have described does work, provided that you use the recommended disc unit. Ours has seen some heavy use over the past month and has been 100% reliable and provided a welcome relief from wrestling with the non-standard standards of the RS232 interface for program transfer.



You will have to assemble a cable

COMPONENTS AND SUPPLIERS

CHINON F 051-MD 5 $^1/_4$ inch floppy disc drive:

ALTEK MICROCOMPONENTS LTD.
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Connectors:

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34 way card edge connector - Cat.no. 2761564A

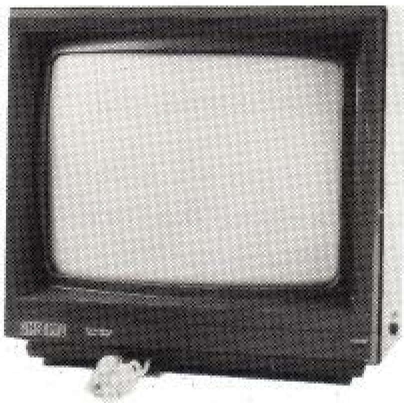
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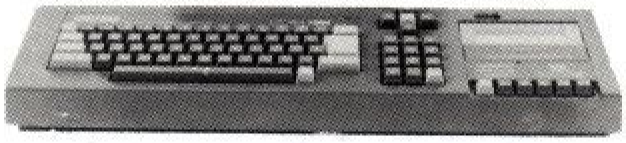
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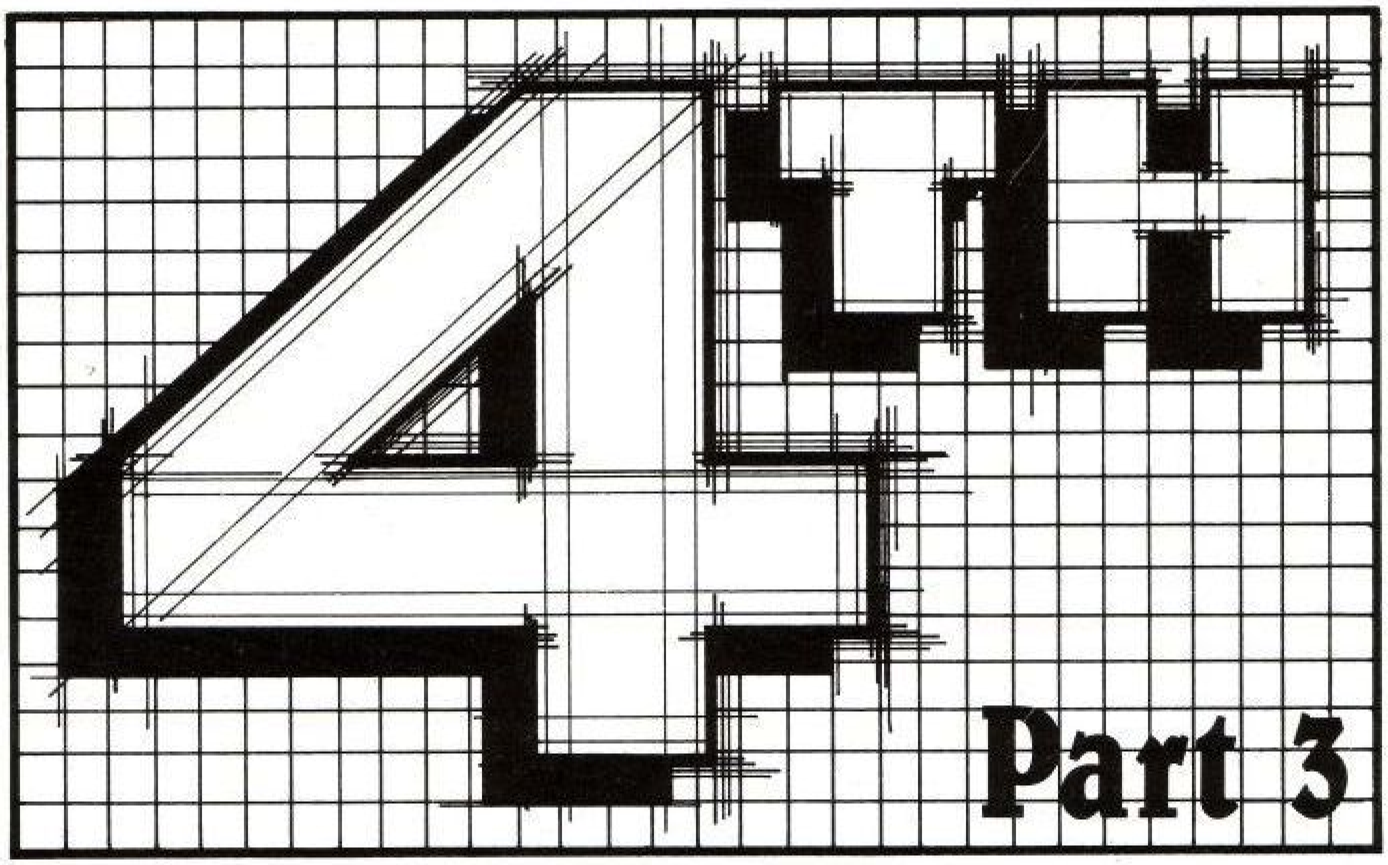
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Comparisons and Loops

The power of any computer program, regardless of what language it is written in, is its ability to take decisions and to branch to any part of the program depending upon the result. All programming languages have the ability to perform tests, and various methods of branching. FORTH has an extreme wealth of words for this purpose, although the reverse polish form is still used, which, if you are used to BASIC or PASCAL, may take a little getting used to.

FORTH comparison operators are very similar to BASIC. '=' will compare the top two values on the stack by first removing them from the stack. If they are equal, then the value of 1 will be placed on TOS (Top Of Stack), otherwise the value of 0 is placed on TOS. In fact, just as in BASIC, any non-zero number is treated as being true. The other comparison operators which are listed in the manual take either the top value off the stack, or the top two values off the stack, and then leave either a 1 or 0 on TOS. Remember then to DUPlicate the numbers should you need them for further operations, otherwise they will be lost forever!

The result of the comparison will then be used by the FORTH control structures. The most familiar of these will be the IF...THEN...ELSE structure as used in BASIC. However, like most things in FORTH it is rather 'back to front' and becomes IF...ELSE...THEN. In fact, although you can use the word THEN, FORTH provides the word ENDIF which is the more logical word to use as in the figure 1 below.

Unlike BASIC the condition or test is performed before the IF word. This is because IF takes the value that is on TOS. If the value is true (i.e. non-zero) then the operations that follow are carried out up to the ENDIF in the first example, or up to the ELSE in the second example. In both cases ENDIF marks the end of the structure and any operations that follow ENDIF will be performed in either case. It will help if you think of the IF word as meaning 'IF-TRUE'. If you prefer, you could re-define the standard IF word to IF-TRUE by the following:

```
: IF-TRUE [COMPILE] IF ; IMMEDIATE
```

[COMPILE] forces the IF word to be compiled into the dictionary and IMMEDIATE causes the IF-TRUE word to operate immediately from within a new word definition. IF-TRUE will therefore work exactly the same as IF does. It should be noted that all the FORTH control structure words can only be used from within a word definition, and not in the immediate mode.

Figure 1

```
<CONDITION> IF <OPERATION IF TRUE> ENDIF <CONTINUE FROM HERE>
<CONDITION> IF <OPERATION IF TRUE> ELSE <OPERATION IF FALSE>
ENDIF <CONTINUE HERE IN EITHER CASE>
```

Try the following two words to get a feel for IF...ELSE...ENDIF:

```
: TEST-IF IF ." VALUE IS TRUE " ENDIF ." END OF TEST " ;
: TEST-IF-ELSE IF ." VALUE IS TRUE " ELSE
." VALUE IS FALSE " ENDIF ." END OF TEST " ;
```

Both words require a value on the stack to start with so type in a value first and then the word itself. For the word TEST-IF, VALUE IS TRUE END OF TEST will be printed out if the value you entered was not zero. Enter zero and just the END OF TEST will be printed out. ." by the way, is the FORTH word to PRINT out the string of characters that follow up to the next " mark. As it is a word you must remember to leave a space between it and the string that follows, unlike BASIC where a space is not needed after the quotation mark. The second word uses ELSE which will add VALUE IS FALSE if the number on TOS is zero.

Using IF...ENDIF we can easily create a word which will check for the [ESC] key being pressed, and return control back to FORTH from within a word definition. This can be very useful as the [ESC] key will not stop the execution of a word that is in an endless loop, and as you may have found to your cost, the only remedy is to switch off the CPC464 or to reset it! The word is:

```
: BREAK? ?TERMINAL IF QUIT ENDIF ;
```

The new word is called BREAK?. ?TERMINAL is a FORTH word that tests if the [ESC] key has been pressed. If it has been pressed then a true value of 1 is left on TOS, otherwise a false value of 0 is left on TOS. IF will then test this value. If it is true (i.e. the [ESC] key was pressed) then the word QUIT will operate. This will clear the RETURN STACK (not the PARAMETER stack) and return control to the 'operator'. The 'ok' message is also suppressed, which is one good way of stopping it from being printed out if that's what you want. If the [ESC] key was not pressed then no action is taken and control is passed to the next word should there be one We will test this new word shortly when we take a look at the loop structures of FORTH.

The IF...ELSE...ENDIF structure can also be nested if required. The word MULTIPLE-IF on listing 1 shows how this is done. The number on TOS is tested to see if its value is 10, 20 or 30, and the appropriate message will be printed out. Note that for every IF there must be a corresponding ENDIF which is rather hard to digest! Luckily the CASE word has been implemented on this version of FORTH, which is a far neater method of testing for multiple values. The word TEST-CASE on listing 1 shows the same test as in the previous example, only this time the CASE structure is used. CASE marks the beginning of the structure. The OF...ENDOF part takes the form:

```
<VALUE TO TEST> OF <OPERATION IF TRUE> ENDOF
```

If the value tested matches up then the list of operations between OF...ENDOF will be performed and then a jump will be taken to ENDCASE which marks the end of the CASE structure. If there is no match then the other OF...ENDOF statements will be tested in a similar manner. If no match is found in these then there is the option of performing some operations between the last OF...ENDOF and the ENDCASE. In the example shown NUMBER IS NOT 10, 20, OR 30 will be printed out if no matches are found. Experiment with various values and you will appreciate the more logical way that the CASE structure works.

Loops

Loops in BASIC can be accomplished by using the FOR...NEXT loop, WHILE...WEND, and GOTO. In FORTH the DO...LOOP structure is used instead of the FOR...NEXT loop and the other structures are:

```
BEGIN....AGAIN
BEGIN....UNTIL
BEGIN....WHILE....REPEAT
```

THE DO...LOOP

This takes the form:

```
<UPPER LIMIT LOWER LIMIT>
   DO <OPERATIONS TO PERFORM>
   LOOP
```

Note that the two values for the loop are the opposite way around to that of BASIC. Try the following word:

```
: TEST-LOOP 10 1 DO
   ." THIS IS A LOOP "
  LOOP ;
```

You will find that THIS IS A LOOP will be printed out nine times and not ten as you might have expected. The reason for this is that the loop terminates when the upper value is reached. You must therefore always add 1 to the actual upper limit that you require. For example, to print out the numbers 1 to 100 you could use the word:

```
: PRINT-TO-100 101 1 DO
   I . LOOP ;
```

At run time, the two values for the loop are taken off the PARAMETER STACK and placed on the RETURN STACK. The FORTH word I copies the current value of the loop index from the Return Stack to the Parameter Stack, which is then printed out by the '.' print word. If the loop values are dependent upon input from the operator (as in the word PEEK - see article 2) then something similar to the following could be used:

```
: OWN-VALUES 1+ SWAP DO
   I . LOOP ;
```

6 29 OWN-VALUES would then print out the loop index from 6 to 29. The 1+ adjusts the upper limit to the correct value, and the SWAP enables the two values to be input in the more logical sequence from lower to upper limit.

Whereas STEP can be used in BASIC, FORTH uses the word +LOOP to increase or decrease the loop index. For example:

```
: STEP-LOOP 101 0 DO
   I . 5 +LOOP ;
```

In this case the value of 5 will be added to the loop each time, and therefore the values 0 10 15....100 will be printed out. To use a negative step value the following would be used:

```
: STEP-DOWN -1 100 DO
    I . -5 +LOOP ;
```

Note the order in which the two values are now specified. -1 makes sure that the final value of 0 will be printed out. Naturally, any operations can be performed between the DO and +LOOP. Printing out the loop index has been used purely as an example.

Loops can also be nested in FORTH. Whereas I returns the value of the inner loop, the word J returns the value of the outer loop:

```
: I-J-LOOP 10 0 DO
         3 0 DO
         I J . .
         LOOP CR
   LOOP ;
```

If you try out the above word you should be able to see how this works.

BEGIN...AGAIN

This is an unconditional loop. The operations between BEGIN and AGAIN will be repeated over and over again:

```
: NEVER-ENDING BEGIN ." AGAIN AND AGAIN " AGAIN ;
```

Try the above word out and the message AGAIN AND AGAIN will be printed out continuously. Unfortunately as mentioned before, pressing the [ESC] key will not stop the printing! Now is the time to make use of the word BREAK?. If you insert this word somewhere between the BEGIN and AGAIN in the last example, then pressing the [ESC] key will now terminate the loop.

BEGIN...UNTIL

This structure takes the form:

```
BEGIN <OPERATIONS...TEST FLAG> UNTIL
```

The operations between BEGIN and UNTIL will be repeated until a TRUE flag is on TOS when the test is performed. In other words LOOP UNTIL TRUE.

The following word will use this structure to test for the 'A' key being pressed:

```
: TEST-FOR-A-KEY BEGIN KEY 65 = UNTIL ;
```

KEY will put the ASCII value of any key pressed on TOS. In this case 65 is the ASCII value for 'A'. The = word will test the value of the key that is pressed. If any other key is pressed (including lower case 'a') then the test will return a FALSE value of 0 and so the loop will repeat itself. When 'A' is pressed the value on TOS will be a true, and the loop will then terminate.

BEGIN...WHILE... REPEAT

This loop structure takes the form:

```
BEGIN <OPERATIONS...TEST FLAG> WHILE
<OPERATIONS TO REPEAT IF TRUE> REPEAT
```

Using a similar word to the last one would give:

```
: PRINT-IF-A BEGIN KEY 65 = WHILE ." A " REPEAT ;
```

This is similar to the last word but this time the operations between WHILE and REPEAT will be repeated if the flag is true. If the 'A' key is pressed now, the flag will be true and 'A' will be printed.

The loop will terminate if any other key is pressed.

Finally for this month, listing 2 gives a few more new words that should prove useful. These are:

DEPTH - This returns the number of parameters (16 bit) on the stack.

RANGE - This will compare the number that is on TOS with two numbers that you specify, with the low value first, followed by the high value. The word PICK was created in last month's article. As an example of RANGE, if you wanted to check if the value on TOS was between say 11 and 28 you would use 11 28 RANGE. If the value is within these limits then a true flag of 1 is placed on TOS, else a false value of zero is placed on TOS. You could therefore use this word from within a definition in whatever manner you require.

SAVE-FORTH - As you have added some new words to the FORTH dictionary you can save this 'new' version to tape so that next time you load it in all these new words are available for your use straight away. Quite a few pointers need to be updated to save your new version, so this word will save you all the trouble of typing in the list of words as shown in the manual. Just type SAVE-FORTH and the new version will be saved to tape. To load it back in after first switching on the CPC464, just enter RUN" in the normal manner.

LISTING 1

```
: MULTIPLE-IF
   DUP 10 = IF ." NUMBER IS 10 " DROP ELSE
   DUP 20 = IF ." NUMBER IS 20 " DROP ELSE
       30 = IF ." NUMBER IS 30 " ELSE
   ." NUMBER IS NOT 10, 20 OR 30 "
   ENDIF ENDIF ENDIF ;

: TEST-CASE
  CASE
  10 OF ." NUMBER IS 10 " ENDOF
  20 OF ." NUMBER IS 20 " ENDOF
  30 OF ." NUMBER IS 30 " ENDOF
  ." NUMBER IS NOT 10, 20 OR 30"
  ENDCASE ;
```

LISTING 2

```
: DEPTH SP@ SO @ - -2 / ;
: RANGE 1+ SWAP 1 - ( Adjust upper and lower limits)
  3 PICK <         ( Compare lower limit           )
  SWAP 3 PICK >    ( Compare upper limit           )
  = ;              ( Compare flag results          )

: SAVE-FORTH
   FORTH DEFINITIONS DECIMAL
   LASTEST 12 +ORIGIN !
   HERE    38 +ORIGIN !
   HERE    30 +ORIGIN !
   HERE FENCE !
   ' FORTH 8 + 32 +ORIGIN !
   HERE ENVIR ;
```

Demonstration of the word RANGE

```
: A-N? ( Test if key pressed is between 'A' and 'N' )
 ." Press any key " KEY   ( Get ASCII value of key)
 65 78 RANGE IF   ( Test if between 65 and 78)
 ." Letter is between A and N " ELSE ( Print if TRUE )
 ." Letter is not between A and N "  ( Print if FALSE )
 ENDIF ;
```

Writing Adventures PART II

The whole idea of this series of articles is to enable 'you' to write your own adventure games. Each month there will be additional BASIC routines presented in a modular form, that will build into an operating system for 'your' adventure.

The line numbers given should be used as shown in the article. in that way you can add to the program in your Amstrad and hopefully end up with a working adventure! There will be some lines that will have sections added to them as we introduce new routines. These lines will be shown in full and will supersede previous lines of the same number.

There will also be a few groups of lines that will be changed completely! These are simply those that let you test a certain section of the code as we go along. Fortunately the number of such lines is very few, so you will not be typing too much extra! Again...the program lines shown in the latest article are those you should end up with.

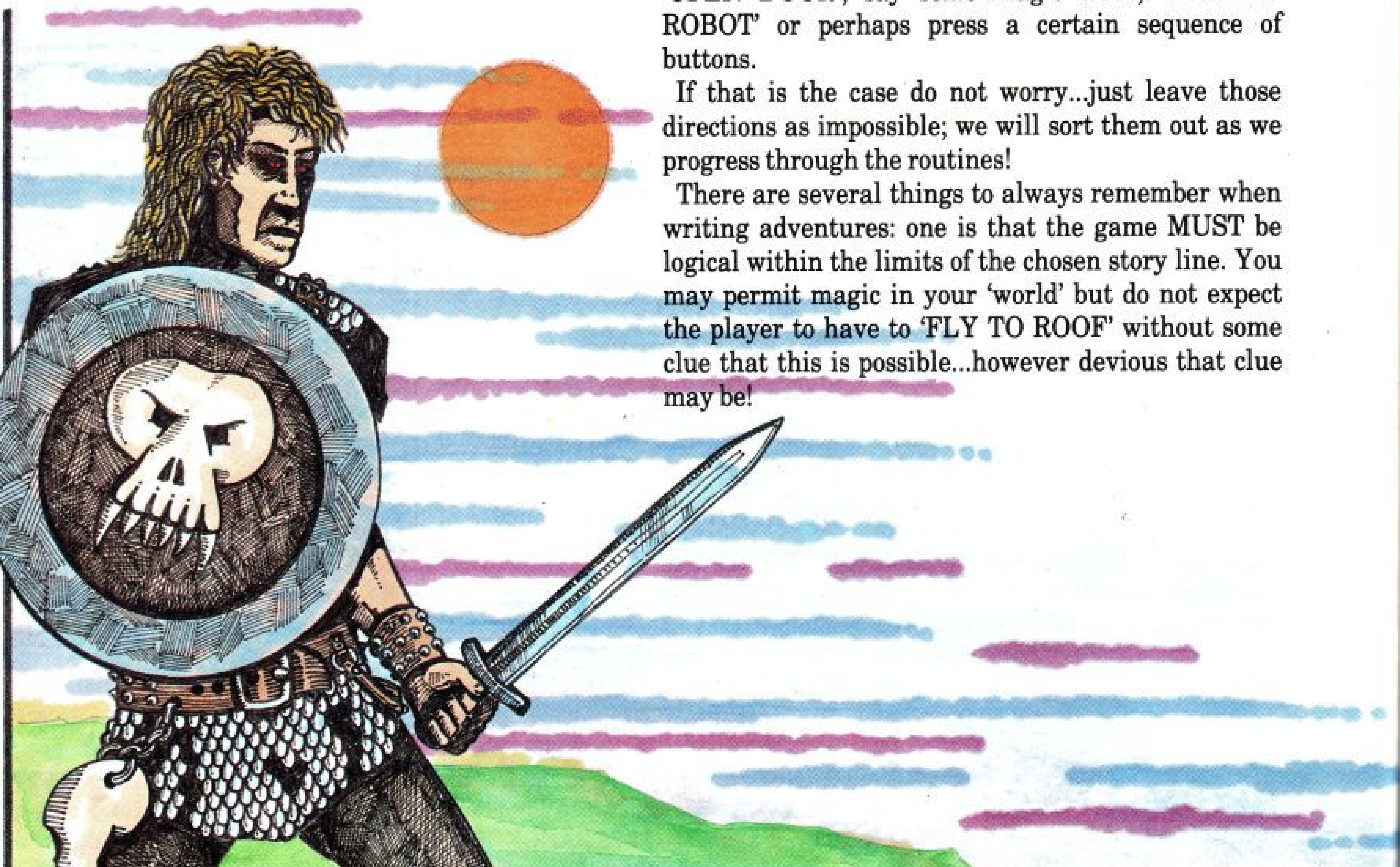
Last month had a fair bit of 'chat' by way of introduction but perhaps not so much about the philosophy behind the system. I cannot stress too much that planning...on paper...is absolutely vital to a good game. The operating system routines may be typed in as and when you feel like it, although even these will benefit by you having a really clear view of what you want them to do for 'your' program. You may even want to modify them, or improve upon them for your particular adventure.

Plan ahead...

You should by now have your scenario 'mapped out' on paper. Together with those objects/ artifacts/ creatures that the player will come across on his/her travels. The routines from part-1 will have enabled you to program in all the locations and also the routes that the player may take to reach these locations. There may well be some locations that you have decided are not immediately accessible by just 'GOING EAST' etc. You may wish the player to 'OPEN DOOR', say some magic word, 'FOLLOW ROBOT' or perhaps press a certain sequence of buttons.

If that is the case do not worry...just leave those directions as impossible; we will sort them out as we progress through the routines!

There are several things to always remember when writing adventures: one is that the game MUST be logical within the limits of the chosen story line. You may permit magic in your 'world' but do not expect the player to have to 'FLY TO ROOF' without some clue that this is possible...however devious that clue may be!



Secondly, but just as important, make your program as 'user friendly' as possible. For example, it is always easy to make an adventure almost impossible by only 'understanding' obstruse words...this is not the point of a good adventure. The problems met should be in solving the game and NOT in merely trying to make oneself understood.

Likewise it is easy to confuse a player by having the location reached by travelling east actually to the north, south or west of the original location. Sometimes there will be a good reason for this...perhaps a maze or a one way portal...but try to keep the general flow of movement logical. Too many inconsistencies will make the player frustrated for the wrong reasons!

I spy...

Having drawn the 'landscape' last month, we now have to furnish it with items that the adventurer will see, and that may be used to help (or hinder)! the completion of the quest.

There are several classes of objects that my occur within your program. Furthermore these classes will be subdivided by certain conditions that 'you' the author will have put upon them. Right from the beginning you must keep a VERY clear record of what will be where. Also what will affect that object, and in turn, the effect that object will have on its surroundings and on the player!

First...what are the different classes of objects? The following list will give you some ideas...you may well think of others that are pertinent to your particular 'world':

1) There are those objects that will be lying around for all to see and subsequently pick up.

2) There are objects that are readily visible but may not be picked up until some other action has been taken or another specific object taken.

3) Some objects may be seen but not taken...perhaps they may reveal something of interest if they are searched!

4) There are objects that may be seen and if action is NOT taken then the player will find an unpleasant surprise in store!

5) There may be some logical reason for an object not being readily visible...either it is hidden under or behind something else, or perhaps it is part of another object.

6) A non-visible object may invoke a special message or action.

We must also consider those objects that the adventurer has already in his possession, either from the start of the game or picked up along the way.

Now you may wish to draw attention to some of these objects as a player moves into a new location; almost certainly those in class 1) and probably most of those in classes 2) to 4). The most obvious way to do this, is to print them in our second window on arrival at the new destination.

One reason for separating the location description from the object description in this way, is that if the object is taken we will not have to spend time altering a sword from where it is hanging on the wall - and for the description to still have the sword hanging there!

On the other hand a door, wall or control panel, although recognised by the program need hardly be included in its own right in the object list at this stage. having said all this...be devious on occasions, include the odd item in the location description even if it does mean that you will have to alter this later. We certainly do not want to be too obvious do we...?

At this stage we want to know four things about these objects:

a) We need to have a long description of the object for display when the player finds it...it is so much more evocative to have something like 'A copper flask with a cork stopper' than just 'A flask'.

b) We need to know at which location the object is to be found. Not only at the beginning of the game but also throughout the entire adventure.

c) We need to know what conditions are set upon the object such as those outlined in 1) to 6) above.

d) Finally we need a short form description for use in displays of Inventory or in response to an input command.

Back to BASIC...

If you look at listing 8 you will see that lines 250-265 READ the DATA for these four pieces of information about each object. Elsewhere the arrays for these have been set to 30, principally to differentiate them from the location arrays that are set to 50. You must dimension the arrays OB$(n), OS$(n), OC%(n) and OP%(n) to suit the number of objects that 'you' intend to use.

Listing 8

```
249 REM ** Read Object Data
250 RESTORE 12010
255 FOR I%=1 TO 8:REM ** Number of objects
260 READ OB$(I%),OP%(I%),OC%(I%),OS$(I%)
265 NEXT I%
```

Listing 9 shows that OB$(n) contains the objects' long descriptions; OS$(n) contains the objects' short descriptions. OC%(n) sets the condition of the object as discussed above (1-6). OP%(n) contains the numeric location of the object; a value of zero (0) is given to those objects in the player's possession.

Listing 9

```
11999 REM ** Object Data
12010 DATA "A short handled throwing axe"
12015 DATA 0,1,"An Axe"
12020 DATA "A small pouch of copper coins"
12025 DATA 0,1,"Some Coins"
12030 DATA "A copper flask with a cork stopper"
12035 DATA 1,1,"A Flask"
12040 DATA "A pair of embroidered leather gloves"
12045 DATA 13,1,"A Pair of Gloves"
12050 DATA "A curious looking key"
12055 DATA 4,5,"A Key"
12060 DATA "Some rags are lying on the ground"
12065 DATA 2,1,"Some Rags"
12070 DATA "A rose bush with one perfect bloom"
12075 DATA 7,2,"A Rose"
12080 DATA "A very dirty, two handed sword"
12085 DATA 4,5,"A Sword"
```

If we immediately jump to where the object data appears in the program this should all become clear...

Lines 12010 on, contain the data for all your objects. I have followed the same pattern as for the location descriptions in that the 'tens' of the line number refer to the object 'number'. Hence object '1' is referred to in lines 12010 and 12015. Although we always hope for no mistakes, this numbering system may help in possible debugging later!

Number	Object	Location	Condition	Notes
1	Axe	0	1	Carried, will kill troll
2	Coins	0	1	Carried, will pay ferryman
3	Flask	1	1	Has attached cork, can be filled
4	Gloves	15	1	Protects hands from poisoned rose
5	Key	4	5	Brass key, found beneath cloth
6	Rose	7	2	Need gloves to pick, charms nymph
8	Sword	4	5	Hidden runes, found beneath cloth

Before entering 'your' object data you MUST carefully list all the objects you intend to include in the program. This list should be in the form of a table as follows:

This list is for example only, and only has a total of eight items. Nevertheless there are several points to watch. WRITE IT ON PAPER FIRST, the objects should be in alphabetical order - this will enable us to 'find' an object more quickly later This could make a appreciable difference if you have a large number of objects. The notes are important so as to remind you of the purpose of each item.

Some are obviously interlinked - the Rags will clean the Sword and enable you to read the Runes that are engraved on it. The cloth that hides the Sword and the Brass Key does not appear in the list of objects because it will only be mentioned when the player EXAMINES the counter in the shop with the 'sign of a knight riding a horse'.

The Axe and the Coins are with the player from the beginning, so are assigned location zero (0). They also have condition '1', so that they may readily be picked up should the player DROP them later.

The Rose appears on a rose bush in location '7' and may not be taken until the Leather Gloves are also taken and worn, hence condition '2'.

So much for object data. Lines 1200-1230 in listing 10 will determine which objects are visible and display them in window #2 when you enter any location.

Listing 10

```
1199 REM ** Display Visible Objects
1200 CLS #2:LOCATE #2,2,2:F%=0
1205 PRINT #2,"You can see:":PRINT #2
1210 FOR I%=1 TO 8:REM ** Number of Objects
1215 IF OP%(I%)<>L% OR OC%(I%)>4 THEN 1230
1220 F%=F%+1:PRINT #2," ";OB$(I%)
1225 IF F%>4 THEN PRINT #2:PRINT #2," more...":WHI
     LE INKEY$<>CHR$(32):WEND:CLS #2:LOCATE #2,2,2
     :F%=0:PRINT #2,"You can see:":PRINT #2
1230 NEXT I%:IF F%=0 THEN PRINT #2," Nothing obvio
     us..."
```

This should be fairly obvious, line 1200 determines where in window #2, the display will start (the location number is still printed - lines 1310-1320, to help you test your program, but the clear window #2 command has been moved to line 1200 - DELETE last month's line 1300).

F% is a 'flag' to tell the program if you are trying to print more lines of display than there are lines in the window. This would cause the display in window #2 to scroll..ugh! So if this is about to happen line 1225 prints 'more', and halts the display until the SPACE bar is hit...then clears the window and carries on with the display from where it stopped.

Lines 1210 to line 1230 scan through all the objects' positions to see if any are at this particular location - AND are visible (OC%<4). If none are found then F% will be zero and an appropriate message is printed. Note the ambiguous 'Nothing obvious...' rather than 'Nothing here'. This covers you for hidden objects...no point in getting caught out with a lie!

Still on the subject of objects! I have included this month, the routine for displaying the player's Inventory. This is accessed by adding listing 11 to your existing routines.

Listing 11

```
2000 X%=INSTR("NESWUDI",Q$(1))
2010 IF X%=0 THEN 1500
2020 ON X% GOSUB 500,505,510,515,520,525,530
2025 IF X%=7 THEN 1500
```

This will be available later as a single key entry, so can also be checked with out present rudimentary input command routine. Note the additions to lines 2000, 2020 an 2025.

The Inventory display is determined by lines 530-560 (Shown in listing 12) and follows a similar format to the object display above.

Listing 12

```
529 REM ** Display Inventory
530 CLS #2:LOCATE #2,2,2:F%=0
535 PRINT #2,"You are carrying:":PRINT #2
540 FOR I%=1 TO 8:REM ** Number of objects
545 IF OP%(I%)<>0 THEN 555
550 F%=F%+1:PRINT #2," ";OS$(I%)
555 NEXT I%:IF F%=0 THEN PRINT #2," Nothing."
560 RETURN
```

Ensure that the FOR...NEXT loop in 540 is only for the number of objects that you have specified. Otherwise you may wonder why your Inventory is scrolling past the window! This is because location zero (0) has been defined as the player and if you scan more elements of array OP%(n) than have been assigned...they will also be zero. this will cause the routine to print a series of null strings from OS$(n) -hence the scroll!

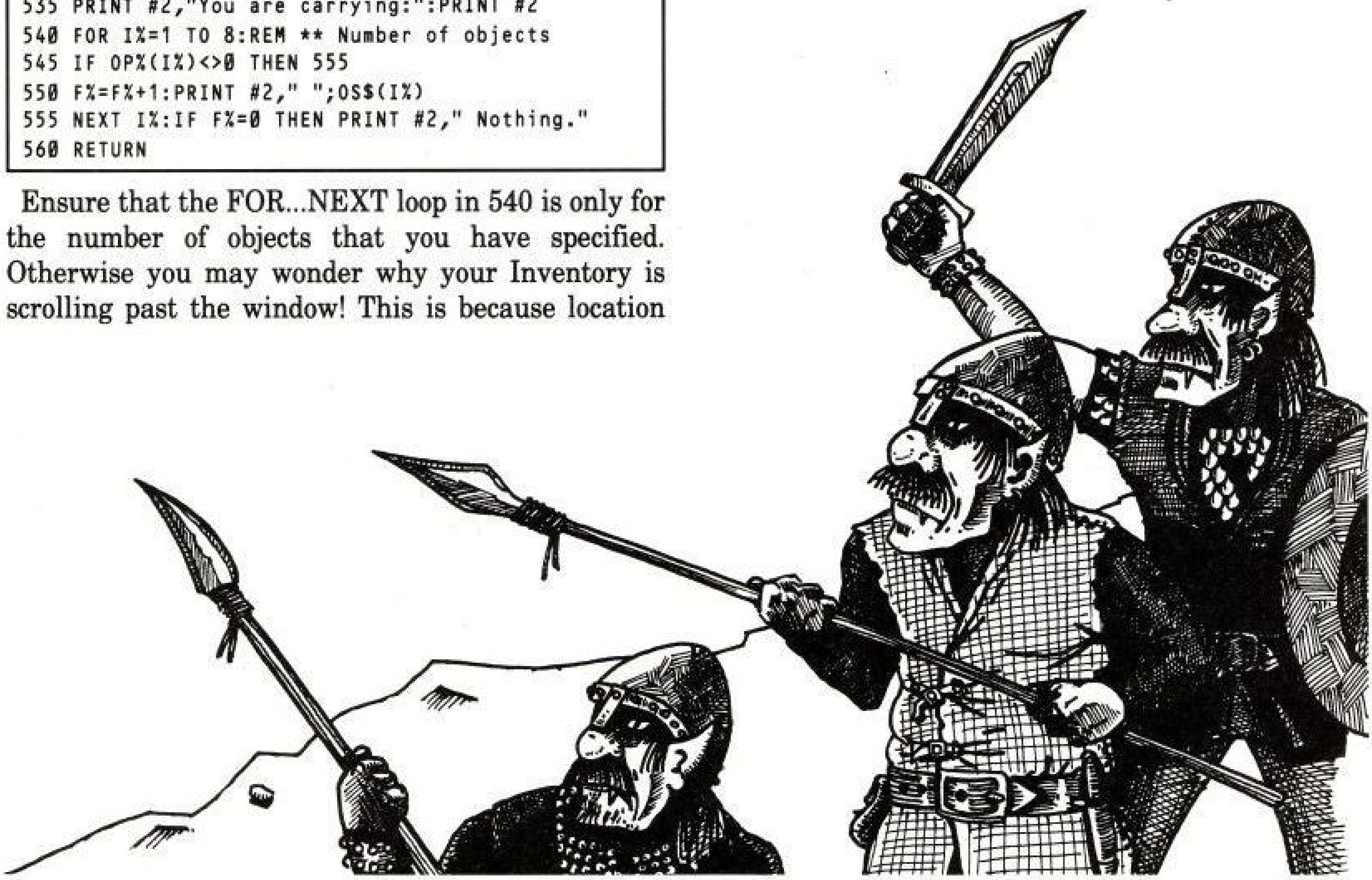
There is no check to see if the Inventory will scroll because I have decided to limit the number of items carried to five. If you want 'your' player to carry more, you will have to include a line similar to 1225 above.

Finally lines 150-160 have the additional arrays and variables encountered this month defined and assigned. Thses are shown in listing 13.

Listing 13

```
150 DIM Q$(1),L$(50),OB$(30),OS$(30)
155 DIM N(50),E(50),S(50),W(50),U(50),D(50),OC%(30
    ),OP%(30)
160 SCORE=0:L%=1:LC%=0:I%=0:X%=0:I=0:DL=0:F%=0
```

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GEMS from GEMINI

Gemini Database

Anyone thinking of using the CPC464 in business, or just for recording a stamp collection, will be on the look out for an easy-to-use database program.

A database in its simplest form is a computerised card index. You may enter the details of each 'card' and then browse through them, sort them into order, or search through them for a particular entry. To be of any real value, these jobs must be considerably easier on a computer database than with pen and paper.

Gemini Marketing has had a lot of experience designing programs for home and small business use. They started with a range of programs for the BBC Model B and have since expanded to take in a range of home micros. Their database for the CPC464 is not a direct crib of a program for another machine, but is a development of earlier products, combining most of the essential features of a data storage system.

The program is provided on cassette, although it's not protected and can be copied to disc if you want. On loading the tape you are presented with the main menu. This offers options, among other things, to search, sort and print records, to perform calculations on them and to summarise their contents. Before any of these functions can be used, however, you must first define the record card itself.

You can choose either the 40 or 80 column modes to design and display your record, so you have plenty of space if your card contains a lot of information. The main restriction is not one of space on the screen, but rather the number of records your can fit into memory.

In RAM

The Gemini database is memory-based. This means it loads all the records in a particular file from cassette into memory in one go, and then manipulates them there. The advantages of this technique are that function like searching and sorting are performed very quickly. The disadvantage is that the size of the file is governed by the amount of available memory.

The sample datafile supplied with the program is for a mailing list and can hold about 110 names and addresses. If each card holds less than this, more cards can be held on the file.

You are completely free to position the fields on your card where you will. This is done by using the COPY key to place small white squares on the screen - one for each character you want in the field. To add titles to the fields, you simply move the cursor to the right spot and type them in. The whole process is very straightforward, and similar to that used by Gemini in their programs for other machines.

When you've finished designing the card, you can set about entering your data. This again is a simple business, since each field is initially filled with the same small white squares, which you overwrite when you type in your entries.

A count is kept at the top of the screen of the number of records you've added and the number remaining before you fill all available memory. These figures, along with the current record and the number of records found that match a given condition, are all headed with only a two character mnemonic. It would have been clearer to have had longer titles for these, even if it meant devoting two lines to them rather than one.

Once you have entered all your data, there are a number of different things that this database will allow you to do with it. The 'find' option will search through your data looking for entries which match your given rule. These rules can be quite complex, and may include inequality and the Boolean functions 'AND' and 'OR', as well as a straight equality. Fields are specified by number, thus the formula 'F5>F4 AND F3= "TEST"' will match all the records where the contents of field 5 is greater than the contents of field 4 and field 3 contains the word 'TEST'. The matching records will be re-positioned at the beginning of the file.

Sorting

If you select the sort option, the program will perform a 'heap' sort, which is one of the faster methods, on any selected field. You can sort in either ascending or descending order.

You can also perform calculations on any fields within a card. These may be simple totals or a more complex formula, defined in a similar way to the conditions for searching. This is a particularly powerful feature of the program. Although the whole package has been written in BASIC with machine code routines, it is commendably fast, and does have the advantage of being able to use any of the built-in mathematical and logical functions of the language.

When it comes to printing the contents of your file, you can specify how you want the information laid out, but only to a limited extent. Gemini have produced a 'Report Generator' which will take data from the database and produce labels from it or incorporate it directly into a standard business letter. This package is extra, however, and costs as much as the database itself.

If you have set up two separate files using the program, then you can append one to the other, as long as they will fit in the available memory together.

Conclusion

Overall, I was impressed with Gemini's database. Although it isn't as sophisticated as Campbell Software's fully machine coded Masterfile 464, it has the virtue of being simple to set up and easy to use -although at a similar price Dialog's slick DFM database includes the labels and standard letter function.

The 20 page manual is well produced and describes the various functions concisely. Like any non-CP/M database the package is limited by being memory-bound, since to write a random-access database requires working in CP/M and then you have to think about a language other than Amstrad BASIC to write in. (Compiled Microsoft BASIC is one option).

It's interesting to see what can be done without resorting to machine-code. With a program like a database, BASIC techniques, if well-used, can prove as effective as assembler albeit taking up rather more space. Perhaps the program is a bit pricey at £19.95; but if you want a good, robust package, you can't go far wrong with this one.

Gemini Home Accounts

Simon Williams gives an account of the Gemini home budgeting software

Gemini Marketing often boasts that three of its directors are Chartered Accountants. This certainly shows in its accounting packages. Everything from a comparitively simple home accounts package, like the one reviewed here, up to the full integrated business suite that it produces for the BBC Micro, are put together in a very professional way.

The package consists of a cassette and manual, packaged in the slim, video-style case that is often used for this type of software. The program is divided into two halves, one for initialising your accounts, and another for day to day 'transactions'.

Ins and Outs

The program can cope with two categories for income and 20 for expenditure (referred to as 'Allocations'). You can set up headings such as 'Salary', 'Electricity', 'Telephone', 'Computer Games', for all the important transactions in your life. When making an entry in any of these categories, you enter the allocation, date, amount and details of the actual transaction. This means that under the heading 'Food', you can describe an entry, for instance, as 'Re-stocking at Tesco'!

You can start your financial year in any month you like, although January and April are probably the most useful. As you build up a record of your finances, you can detail the entries in any allocation at any time, summarise your expenditure overall, and even get the program to make predictions of likely expenses in coming months. This is particularly useful if you need to plan for an extra expense and want to see how it affects your bank balance in the long term. When you set up your account, you can enter the level at which your bank will start to charge you for your account, and the program will then automatically warn you of impending bank charges as part of its forecast.

The program supports printed output of just about everything. Whenever you display any details of your accounts, you are given the option to print it out. This option assumes you have an 80 column printer (such as the DMP1) connected and switched on. The printed copy is well laid out on the page, and is always headed with your name, account number, current date and the start of your financial year. If you have no printer, all output is directed to a mode 2 screen, instead.

If you like to show your finances graphically, then the package provides a set of histograms that will do just that. These aren't offered as hard copy printout.

Conclusions

The real value of a home accounts package only really shows if you are conscientious enough to keep it up to date. If you spend time balancing your books at the moment with pencil and paper, then a computerised account will certainly speed things up for you. Gemini's package is as comprehensive as your're likely to need, and shows what can be done with a sound approach to a common application.



Gareth Littler, Director of Education & Training at Northern Computers

Amstrad Education Campaign

*** GARETH LITTLER OF NORTHERN COMPUTERS, AMSTRAD'S EDUCATIONAL DISTRIBUTORS, GIVES A BEHIND-THE-SCENES VIEW OF THE EDUCATIONAL COMPUTING MARKET AND CONSIDERS THE EFFECTS THAT THE AMSTRAD CPC464 IS HAVING.**

The 'Amstrad Education Scheme' is the title that we have chosen to describe a massive Spring campaign to capture a major share of the fiercely competitive education market. Under the Scheme, 40,000 educationalists will receive a custom-designed leaflet informing them about the CPC464 with its disc drive system and offering a discount, 12 free software packages and a 12 month free educational service contract. These features will equip the computer to face a whole multitude of rivals.

Commodore

In the mid 1970's the Commodore Pet was the first microcomputer to be widely accepted as an aid to the curriculum. Commodore then decided to commit suicide in terms of educational computing.

The Pet 2000 series, 4000 series, Vic 20, CBM 64 and 16 were incompatible. The new machines would not run all the programs written on the older computers and then production of old models was stopped. No wonder that Computer labs trying to build up gradually with Commodore equipment have been left in chaos.

For the Amstrad, there is a commitment that future larger models will be compatible with the CPC464 in order to maximise software availability, so we should avoid the pitfalls or incompatible models.

Apple

The Apple story is more fascinating. In the early 1970's Steve Jobs and Steve Wosniac built a microcomputer in their garage in California and called it an Apple. The giant mainframe computer companies ignored these amateurs with their little computer, yet by the late 70's Apple was a multi-million dollar American success story that had sold more computers in more countries than anybody else.

Apple came to the U.K. about 5 years ago and those of us who were trained with their equipment and ideas for the future owe much more to Apple. They introduced us to colour output on a domestic T.V., high res graphics, built-in speaker, Computer Assisted Learning [CAL], computing across the curriculum and not just computer studies, Computer Aided Design [CAD]; all supported on a micro rather than larger systems.

Apple supported U.C.S.D. Pascal and established Logo as a language teaching aid. They pioneered mouse and icon technology and despite their success in the U.S., their equipment in the U.K. tends to be used in higher education and school offices.

Interest in the CPC464 appears to be completely unrestricted, with enquiries coming in from primary and secondary schools right through to polytechnics and universities.

RML

Research Machines Ltd. have large numbers of educational software packages now available for the RML 380 and 480Z. These should benefit the CPC464.

Johnathan Briggs of Logic Programming Associates discovered that when he downloaded Micro - Prolog for the RML 380Z, to the CPC464 - it would run without modification. This is an 18K assembly language program.

Not all suppliers with software implemented on the 380 and 480Z will be so fortunate; they may have to make some modifications to their programs. We have now written to the managing directors of the software houses offering primary, secondary and higher education programs for the 380 and 480Z, suggesting that they should also offer these programs for the Amstrad CPC464.

An educational institution can buy three 64K Amstrads under the education scheme for approximately the same amount of money as it costs to buy one 64K RML 480Z.

BBC

In 1981/2 the BBC gave their stamp of approval to a computer designed by Acorn Computers Ltd. At the time, the BBC computer was ahead of its time and remarkable value for money. This machine has dominated computer literacy and training projects for the last 2 years.

John Coll helped to guide the BBC computer into software and literacy development projects, communication, and local area networking [LAN]. He was also a very positive influence towards Britain's current lead in the education and training area of information technology. Many of us within the educational sector of the British microcomputer industry owe much to John's ideas and foresight.

More recently, things have not gone well for Acorn as reflected by their troubled shares on the stock market.

John Coll departed to work for the government-sponsored MEP software project. Acorn then spent about 10 million pounds failing to capture a share of the American education market. They then invested in the Acorn business computer [ABC] but the 8 different models of this machine appear to be unwelcome additions to an overcrowded business computer sector. Even the 32K BBC computer is now being described in the press as 'aging and overpriced'.

In order to bring the BBC back into line with the CPC464, Acorn would have to bring out a model 'B' with double the memory [64K], massively cut the price to about £200 + VAT and give away a 12" green monitor, a cassette datacorder and 12 software packs with each BBC computer.

We now have the first networking facility for the CPC464 which allows it to work as a terminal on a Minstrel network running the TURBO - DOS system, also a number of Amstrad local area networks are currently planned.

A comprehensive implementation of BBC basic will soon be available and the BBC software houses such as Bourne and Gemini have started transferring their programs to the Amstrad. With these facilities, the CPC464 is now proving a worthy alternative to the BBC in education.

'Also Rans'

Over the last few years a number of computers have been marketed to education without major impact. Notable machines include Nascom, Atom, ZX81, QL, Dragon, Newbrain, Tangerine, Oric and Einstein.

The Amstrad provides such value-for-money that enquiries and orders are coming in from virtually every education authority in the country. Also, with over 175,000 units in use, the CPC464 is tearing away from the 'also ran' category with a vengeance.

Much of the countrywide interest has been due to the education 'load' policy. Under this scheme, advisers, M.E.P. centres, and educationalists have borrowed an Amstrad from Northern Computers for up to 14 days. Many liked what they saw because virtually all of them decided to buy their Amstrad, rather than return it.

Conclusion

The main sources of good educational programs, currently being transferred to the CPC464 are; Research Machines, BBC, Spectrum and CP/M software houses. With this wealth of software coming on line plus future, larger machines in a range of compatible, low-cost Amstrad computers, we are likely to see a lot more of the Amstrad name in the educational institutions of this Country.

** Gareth Littler, a graduate of Liverpool University Science Faculty, is Director of the Education and Training Division at Northern Computers.*

BEGINNING MACHINE CODE

By P.K. McBride

In last month's issue, we looked at the techniques needed to get a single character 'sprite' moving in different directions, under keyboard control.

In this article, we will tackle another way of creating sprite-type images. This time there will be more of them, they will be larger, and they will move at variable speeds across a background without destroying it.

Several new techniques are used in this routine, of which the most important is probably the use of index register addressing. The Z80 chip has two index registers, labelled IX and IY, and a set of commands for handling them. The registers are used to hold base addresses to which displacements are added to point to particular locations in memory. So, if IX held 40000, then the instruction 'LD A,(IX+8)' would load the accumulator from 40008. The displacement must be a single byte (0 to 255).

Each sprite is allocated a block of memory for storage of the data: present position (in x,y hi-res co-ordinates), direction and speed of movement (as x,y vectors), and the codes of the four characters which make up the image. If the index register IX is loaded with the address of the first byte in the block, then the data can be accessed with IX instructions.

```
Base  IX+0  lo-byte y co-ordinate
      IX+1  hi-byte y co-ordinate
      IX+2  lo-byte x co-ordinate
      IX+3  hi-byte x co-ordinate
      IX+4  lo-byte y vector
      IX+5  hi-byte y vector
      IX+6  lo-byte x vector
      IX+7  hi-byte x vector
      IX+8  top left character
      IX+9  top right character
      IX+10 bottom left character
      IX+11 bottom right character
```

Sprites are printed on the screen using the GRA WR CHAR firmware routine, rather than TXT WR CHAR. This means that the image's position is determined by high resolution not print co-ordinates (like BASIC 'TAG' printing). The position can be changed by as little as one pixel, and the image will be 'printed' even if it is on or beyond the screen boundaries, allowing a smooth slide on and off.

Using high-resolution graphics means that two bytes are needed for each number. Here,all arithmetic is done in the HL register. For a slow upward movement, the y vector bytes would hold 1 and 0. These are transferred from the data block to the DE register pairs, and added in using 'ADD HL,DE'.

Where the movement is negative, the ADD instruction is still used, as the vectors are stored in an inverse form (two's complement). For a displacement of -6, the vector bytes would hold 250 and 255.

```
Current y 300 = 0000000100101100 = 1*256+4
y vector -6   = 1111111111111010 = 255*256+250
new y 294     = 0000000100100110 = 1*256+38
```

The actual result is of course 65536 higher, but the '9th' bit of the high byte is lost, leaving the new, lower value for y.

While the CPC464 is quite happy to accept x,y values that go beyond the screen area, in practice you will want to impose certain limits. It's no good having your sprites drifting off relentlessly into the wide blue yonder. Here the boundaries have been set at 704 by 432. This is larger than the screen area of 640 by 400, and allows sprites to slide off any edge. The 2x2 character sprites occupy 64 by 32 pixels (Mode 0) and their position is determined by the co-ordinates of the top left corner. With the ORIGIN offset to -64,0, a sprite is first fully visible at 64,32. It begins to disappear off the right of the screen from 639, and off the top from 399.

There is no single instruction that will check the value of a two-byte number, so the bytes must be checked separately. If the total value has fallen below zero, then the high byte will hold 255.

```
LD A,H        Hi-byte
CP 255        Less than zero?
JR NZ 3       Jump if not
LD HL,reset   new x or y value
```

HL will be reset to 176,1 (432 - top of screen) if y is less than 0, and to 192,2 (704 - right edge) if x is less than 0. Both bytes need to be checked for the top and right edges. With the y co-ordinate, the high byte is first compared with 0. If it is 0, then no further check is necessary as the sprite can be no higher than 255. If not, then the low byte is checked:

```
LD A,L     Lo-byte
CP 176     Top limit
JR C 3     Carry set - under 176
LD HL 0,0  Reset y
```

The Carry flag is set if the number in the accumulator is less than the one with which it is compared.

The sprites are composed of four characters. Interesting angular images can be constructed out of the existing graphics, or new characters can be defined with the SYMBOL command. Remember that if a SYMBOL AFTER command is used in the controlling BASIC program then it must come before the MEMORY command.

Five ROM calls are used in the routine:

SCR ACCESS sets the write mode for the Graphics VDU. There are four possible modes in which pixels can be plotted (and characters printed): FORCE, XOR, AND and OR modes. The latter two are of no direct interest here.

FORCE is the normal state - the new display overwrites and replaces the old.

In XOR mode, the new material is eXclusive-OR'd with the old - a pixel is plotted only if it was previously clear. The background area of the sprite (bits set to 0) becomes transparent, and the appearance of the foreground depends upon the material underneath. There are four possibilities for any pixel -PAPER, PEN 1, PEN 2 or PEN 3. In binary these are 00,01,10 and 11.

In XORing two numbers, the resultant bits are set to 1 only if one of the compared bits is set to 1, but not if both are. In the routine given here, the sprites are printed in PEN 1, and other screen material in PEN 2. This gives the following possibilities for any pixel:

```
                    SPRITE
                PAPER(00)        PEN1(01)
         PAPER(00)00             01
SCREEN
         PEN2(10)10              11
```

Where the inked areas of sprite and screen collide, the resulting pixel will be plotted in PEN 3. If the INK colour of PEN 3 is redefined to be the same as that of PEN 1, then the sprite image will appear unbroken.

The great beauty of XOR mode is that when the same image is printed twice in the same place, it simply wipes itself out without trace.

```
                NEWSPRITE
                   PAPER(00)    PEN1(01)

PAPER(00)          00           01     **
PEN1(01)           01**         00

OLD
SPRITE

PEN3(11)           00           10
--------------------

SCREEN

PEN2(10)           10           11     **
```

Because the sprite images are both in the same place, the possibilities marked ** won't occur. The screen is left in PAPER and PEN 2.

The next new ROM call is KM READ KEY (&BB1B). This sets the Carry flag if a key is pressed, and returns the value in A of the character. Here it is used as a simple escape mechanism. If any key is pressed, then the routine will be exited.

GRA MOVE ABSOLUTE (&BBC0) moves to a point determined by the values held in DE (x co-ordinate) and HL (y co-ordinate). The routine corrupts the AF,BC,DE and HL registers.

GRA WR CHAR (&BBFC) prints a character on the graphics screen, with the top left corner of the character at the current x,y position. The x co-ordinate is moved to the right corner of the character - 32 pixels in Mode 0, 16 in Mode 1. The same four registers are corrupted.

GRA MOVE RELATIVE moves to a new point relative to the last point plotted. After the top two characters of the sprite have been printed, the x,y position must be moved down 16 pixels and back 64. The values are given in the HL and DE register pairs, and must be in two's complement form - minus values not being acceptable to machine code.

```
LD HL 240,255=-16
LD DE 192,255=-64
```

The code is arranged in three sections: a simple control loop which checks the keyboard and calls up the main routine if no key is pressed; the main handling routine; and a printing sub-routine.

The control loop can be replaced with a larger code program, or omitted altogether, with the sprite handling routine being called from within a BASIC program. In either case, note carefully those absolute addresses which must be changed.

The main routine begins like this:

```
LD B,8
LD A,(40960)
LD C,A
LD A,0
BIT 0,C
JR Z,105
```

The byte at 40960 is the sprite controller. Any bit which is set indicates an active sprite:

BIT NUMBER	7	6	5	4	3	2	1	0
STATUS	0	0	1	0	1	0	1	1

This shows that sprites 5,3,1 and 0 are active, and are to be moved. In the BASIC program which runs the code, the bits are set in the line:

```
240 POKE 40960,PEEK(40960) OR 2↑n
```

- where n is between 0 and 7. When sprite 5 was turned on, after 3, 1 and 0, the byte held is 11. 2↑5 = 32, and 32 OR 11 gives 43 - 00101011. When bytes are OR'd, the resultant bit is set if either or both of the compared bits are set.

The byte at 40960 is transferred to C and then examined with the instruction 'BIT 0,C'. If the bit is not set, then the zero flag will be set, and the program skips to the end of the loop. There it meets the instruction 'SRL C'-Shift Right Logical C. The bits are all shuffled one place to the right, so that the control bit for the next sprite comes into bit 0 in C, ready for checking next time round.

The accumulator holds the low byte of the address to be stored in the IX register. It is increased by 12 each time round the loop, as the data blocks for the sprites are 12 bytes long. When an active sprite is found, the value in A is transferred to a byte within the code:

```
LD (40999),A
LD IX,zz,166
```

'zz' is at 40999. 'Rewriting' the code like this is a convenient way to pass the displacement value to IX. If you relocate the code, or add to it, then the exact address of this byte must be calculated and written into your code. The sprite data is located in high memory at 42496 (0,166). It will just fit with a disc drive attached.

The remainder of the routine is straightforward. The x,y co-ordinates are collected into the appropriate registers, then all registers are stacked before calling up the sub-routine to print the sprite. Displacement values for x and y are then collected, added in, and the new values checked for screen limits before the print routine is again called. Notice how the HL and DE pairs are swapped using 'EX DE HL' so that calculations for the x co-ordinate (held in DE) can be performed in HL.

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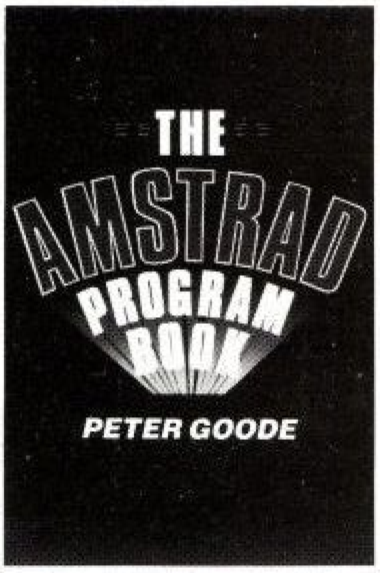
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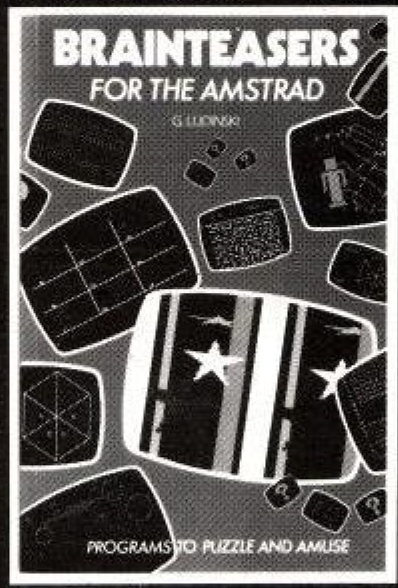
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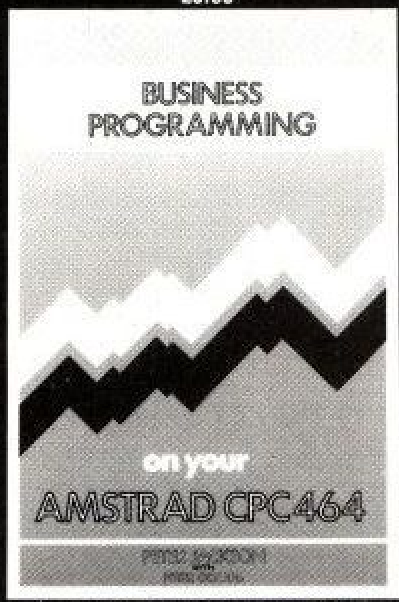
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The objective couldn't be simpler: write the best program submitted to the AMSTRAD USER review panel. Every other month £2000 will be shared amongst the very best entries.

RULES

1 The winner(s) will be the entrant or entrants who submits the best program. It may be any piece of software that runs on the CPC464 or CPC664.

2 The name of all the winners will be printed in the next issue of Amstrad User.

3 All entries must arrive by May 14th 1985. Entries arriving after that date will be included in the next issue's competition.

4 All entries must INCLUDE a disc or cassette copy of the program with some codes where applicable (plus loading instructions where necessary!), AND A SIGNED COMPETITION ENTRY FORM.

A full listing would be helpful, but not essential. A brief summary of the program and its purpose should accompany all entries.

5 All entries will be treated in strict confidence.

6 Neither AMSOFT nor Amstrad can be held to be responsible for any loss or damage to any submission.

7 No correspondence can be entered into concerning programs submitted for the cash prize competition.

8 The decision of the judges is final.

9 It is a condition of entry that all entrants have exclusive ownership of the copyright of the material submitted, and that the winners agree to assign all copyright in the winning program to Amstrad.

All entrants must undertake not to submit the same or a similar program to any other magazine, publisher or organisation until after the announcement of the winning entry.

10 Amsoft may offer to publish programs either in Amstrad User or as commercial software, in which case amsoft will agree the terms on an individual basis with the author(s) concerned. Amsoft reserves the right to amend, alter or revise any program that it publishes.

11 No employees of Amsoft or Amstrad, or their relatives may enter this competition.

12 All entries must have the name and address of the programmer as REM's in the first few lines of the program or loader.

HOW TO ENTER:

Think about your program, and map it out in a series of events or features. Write the program onto cassette, based around these events and check that the program runs as intended. Once you are satisfied, send a copy of the cassette in a suitable envelope along with the following:

1) A brief summary of the program in 500 words or less.
2) The completed competition entry form, which must be signed.
3) Program listings, if available.
4) SAE if want your entry returned.

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AMSTRAD CPC464 USER

No entry is valid unless accompanied by this official entry form.
Only User Club members are eligible to enter.

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***NB All programs must be submitted in UNprotected form. Preferably on disc!**

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I have enclosed a:

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☐ listing
☐ SAE for the return of my entry
☐ A summary of up to 500 words

I am over 18 years of age. YES/NO : Age if under 18 ......

(The signature of a parent or guardian is required where the entrant or the nominated representative of the entrants is under 18 years of age.)

SIGNATURE .... Date ....

Program name ....

CPC464 USER CLUB

£2,000 Software Competition

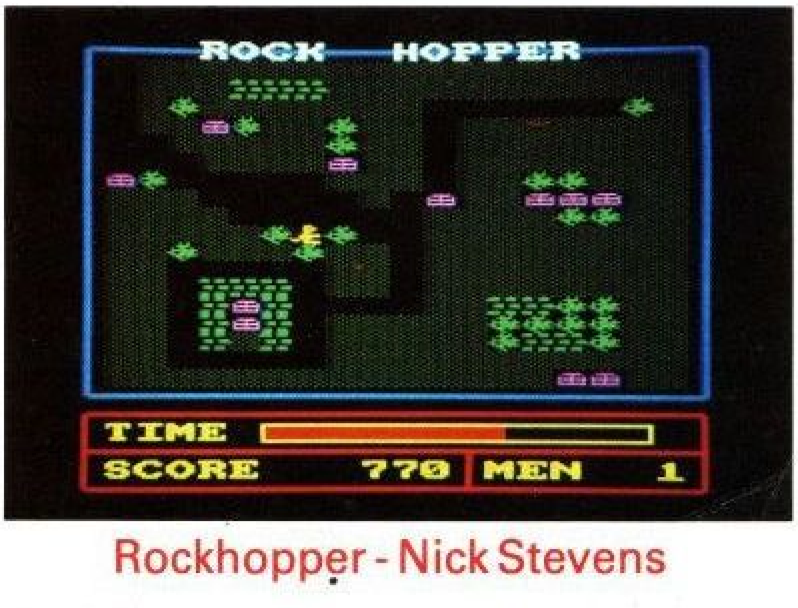


Mr Murffit won the last software competition for his 'Symgen' character definer. The program is being re-worked, and extra facilities such as disc handling added. It should be available as an Amsoft product. The picture shows Chris Horseman (right) of Amsoft handing over a cheque for £2,000.

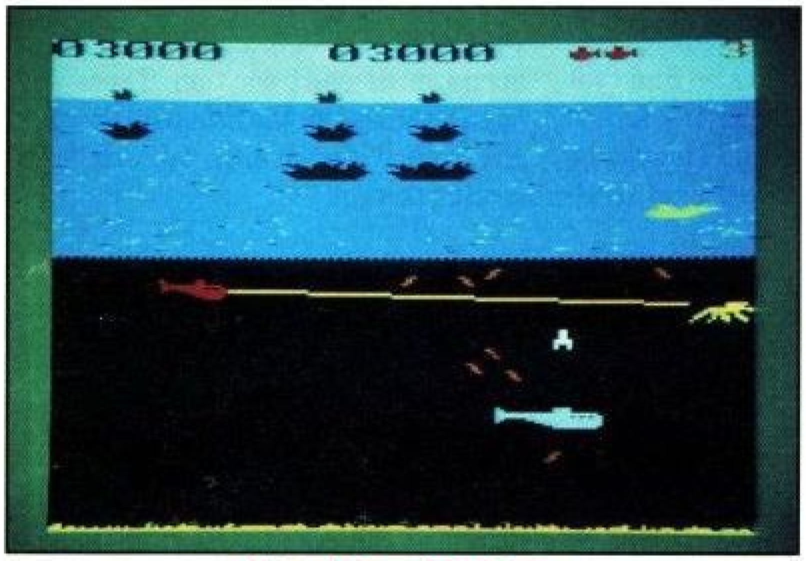
The new software competition was as difficult to judge as ever. This time games came out on top. The User Club has had quite a few letters complaining that it's unfair to give only one large cash sum as a prize, since this meant that most members did not stand a chance. In an attempt to rectify this, we changed the rules from the March issue to allow us to split the £2,000 between any worthy applicants.

The first prize of £1,000 goes to Nick Stevens for his 'Rock Hopper' program. Stephen Gray wins the £750 second prize for his 'N-Sub' game, and the third prize goes to John Bowie of Brighton whose 'Diary' wins £250. It is worth spending a little bit of time looking at why these programs succeeded where the others failed.

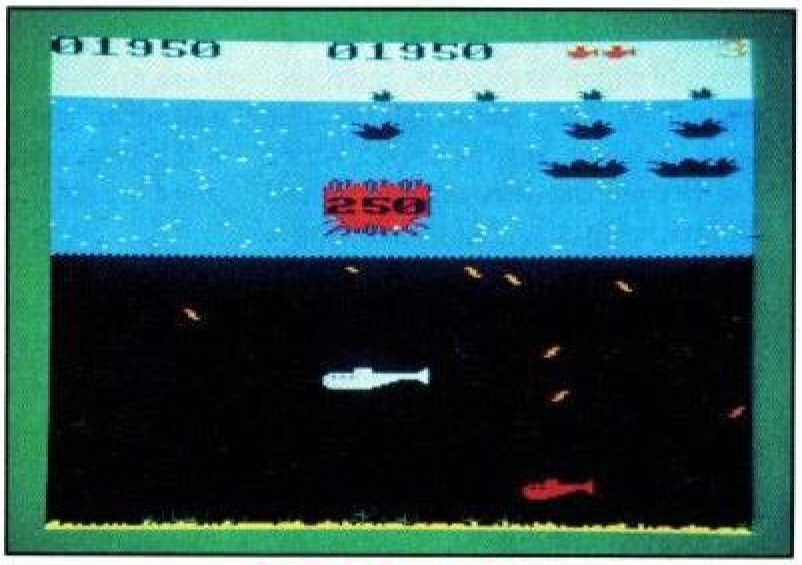
In a word - presentation. All these games have a commercial feel about them. The last competition winner won because the documentation was well presented, and the screen was neat with simple prompts; 'Rock Hopper' is a similarly well presented. Being a game, it does not require very much in the way of instructions - where it scores is in the design of the screens and the originality. You take the part of Freddy, a little kangaroo like creature. You have three lives with which to work through a network of caves and plunder the treasure within. However the caves are quite unsafe; if you should burrow under a rock it will fall and kill you. You play against time so it is an arcade type game but you have to work out a route to allow you to get to all the treasure. This may mean that you have to build a staircase of fallen rocks to make sure that you can get out of a hole. The rooms are very well designed and this makes for a more addictive game. If you are the really fussy sort, then



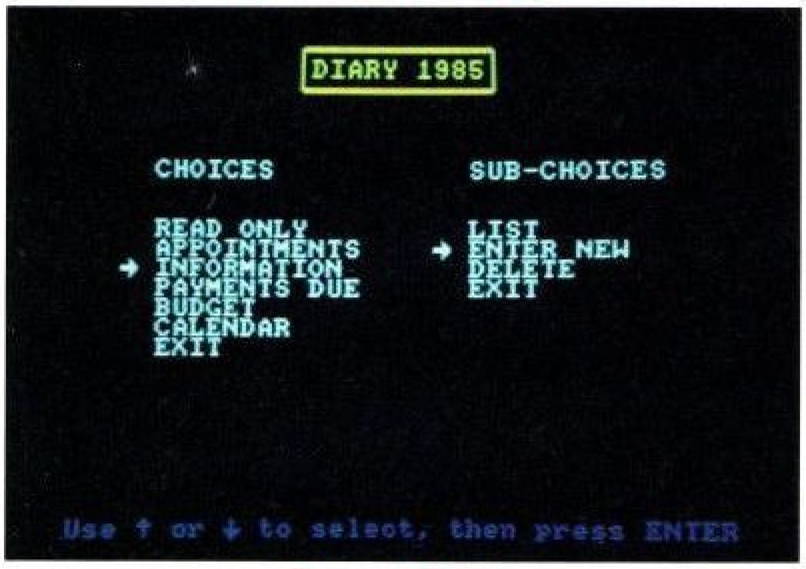
Rockhopper - Nick Stevens



N-Sub Stephen Gray



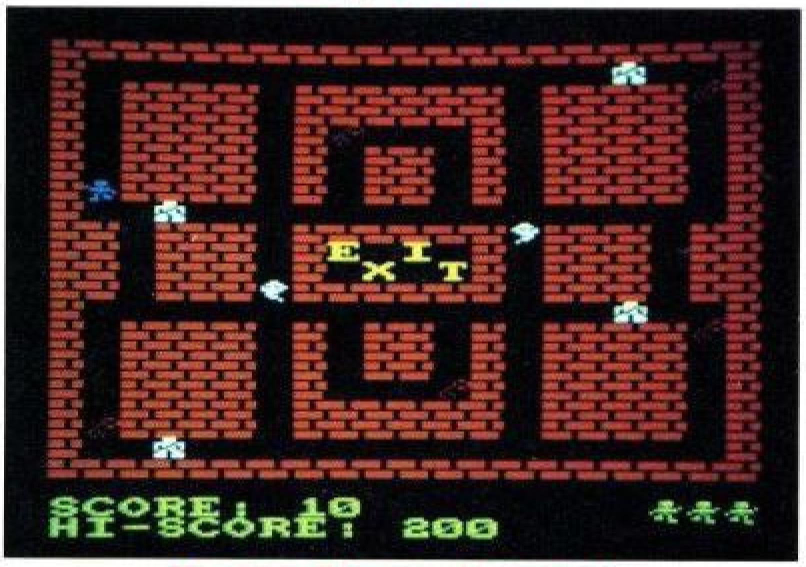
N-Sub Stephen Gray



Diary - J.Bowie



Gizmo - Mr.S Lawton



Dungeon Danger - Jason Rider

you can use the board designing program, and design your own screens using a separate program. These can then be read into the main program.

The second prize winner is not quite so clever, but it does have a lot of nice little touches. To play 'N-Sub' you have to register your name and enter your level of ability. Once you have told the program who you are, you play a good ship zapping game. The hazards include laser toting submarines and depth charges. This program suffers from not running fast enough so all it needs is a touch of machine code at the slow bits and it could be a very playable game. Awarding the third prize to a diary program was not a decision based on wanting to have a 'useful' program in the top three, but it does show that the competition is open to all kinds of programs. Here again it was presentation which impressed the judges. The entry fields are clearly marked, and the use of both 80 and 40 column modes is sensible. We hope to list at least some competition prize winning programs in the next issue.

The runners up

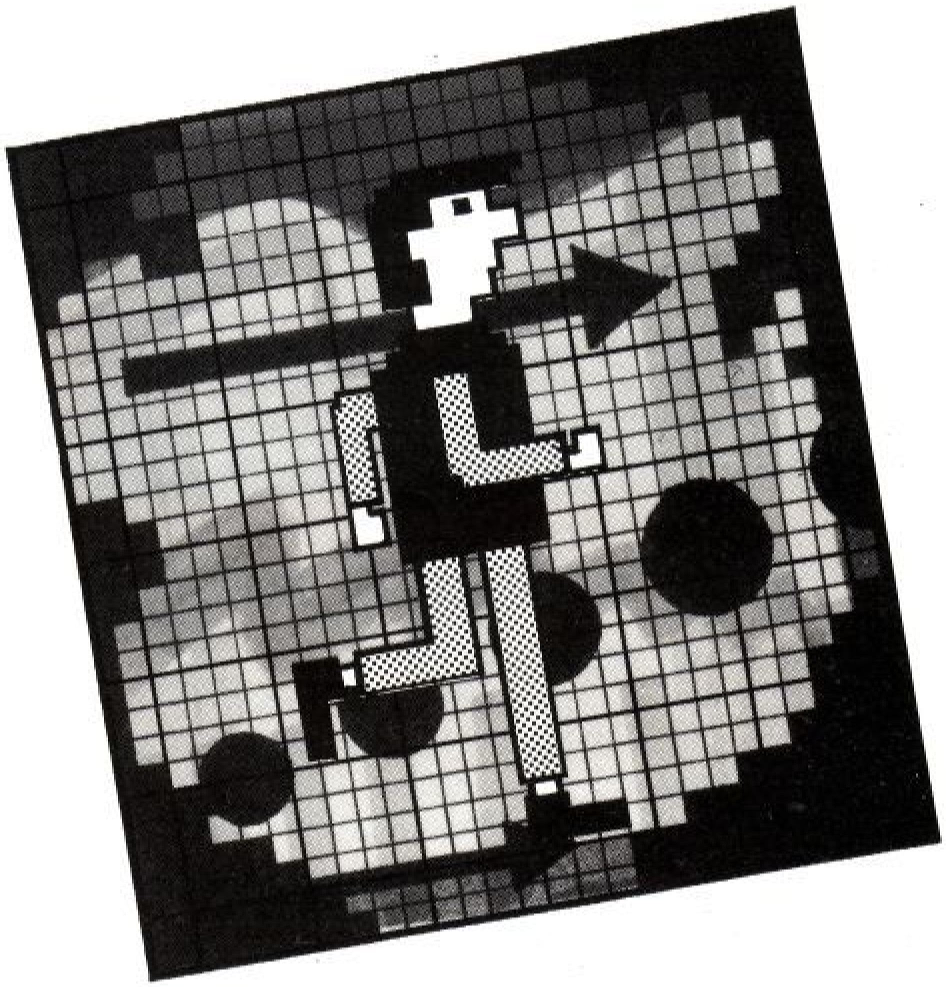
Good educational programs are very rare. All too often a mediocre game is passed off as being 'educational'. A program to teach young children where various parts of the body are, is a new idea to us. 'Gizmo' is truly educational, the presentation and the idea are nice. The author is to be commended on a good try.

What made 'Rock Hopper' a good game was that it did not attempt to do anything which is beyond the speed of BASIC. Dungeon Danger on the other hand is a monster-and-mazes program which has fallen foul of this trap, and once frustration sets in, it is possible to become bored with the game.

The sprite routine has been kept as short and simple as possible, and therefore suffers from some defects. The speed at which sprites travel varies with the number that are active, and the images flicker slightly. Adding a variable delay loop will help to ease these problems. You will also find that any sprite which starts on the screen will leave an image behind. This can be cured by adding a code (or BASIC) routine at the beginning to print every sprite in its start position. These will then be erased on the first pass through the loop. Next month we will start hitting things!

BASIC version and demo program.

```
1   'SPRITE2 - P.K.MCBRIDE 1985
10 MEMORY 40959
20 a=40960
30 READ b:IF b<>999 THEN POKE a,b:a=a+1:
   GOTO 30
40 REM control loop with escape
50 DATA 0,62,1,205,89,188,205,27,187,56,
   5,205,22,160,24,246,62,0,205,89,188,2
   01
60 REM main handling routine
70 DATA 6,8,58,0,160,79,62,0,203,65,40,1
   05
80 DATA 50,39,160,221,33,0,166,221,110,0
   ,221,102,1,221,94,2,221,86,3
90 DATA 197,245,213,229,205,146,160,225,
   221,94,4,221,86,5
100 DATA 25,124,254,255,32,5,33,176,1,24
    ,12,254,0,40,8,125,254,176,56,3,33,0
    ,0
110 DATA 221,117,0,221,116,1,235,225,221
    ,78,6,221,70,7,9
120 DATA 124,254,255,32,5,33,192,2,24,12
    ,254,2,56,8,125,254,192,56,3,33,0,0
130 DATA 221,117,2,221,116,3,235,205,146
    ,160,241,193
140 DATA 198,12,203,57,16,141,201
150 REM print subroutine
160 DATA 205,192,187,221,126,8,205,252,1
    87,221,126,9,205,252,187,33,240,255
170 DATA 17,192,255,205,195,187,221,126,
    10,205,252,187,221,126,11,205,252,18
    7,201
180 DATA 999
190 CLS:POKE 40960,0:REM clear control b
    yte
200 FOR n=0 TO 7:p=42496+n*12
210 REM p is base address for each sprit
    e data block
220 PRINT"Sprite number ";n
230 INPUT "Active (y/n)";a$:IF a$="n" TH
    EN 390
240 POKE 40960,PEEK(40960) OR 2 ↑n
250 INPUT "x start position ";x
260 x1=INT(x/256):x=x-256*x1:POKE p+2,x:
    POKE p+3,x1
270 INPUT "y start position ";y
280 y1=INT(y/256):y=y-256*y1:POKE p,y:PO
    KE p+1,y1
290 INPUT "horizontal speed (minus if le
    ft)";h
300 hi=0:IF h<0 THEN h=256+h:hi=255
320 INPUT "vertical speed (minus if down
    )";v
330 hi=0:IF v<0 THEN v=256+v:hi=255
340 POKE p+4,v:POKE p+5,hi
350 PRINT "Give codes in order 1 2"
360 PRINT "                      3 4"
370 FOR t=8 TO 11:INPUT "character code
    ";c
380 POKE p+t,c:NEXT
390 NEXT
400 MODE 0:PEN 2:ORIGIN -64,0
410 REM background material for demo
420 FOR n=1 TO 100:PRINT"*****";:NEXT
430 INK 3,24
440 PEN 1
450 CALL 40961
```

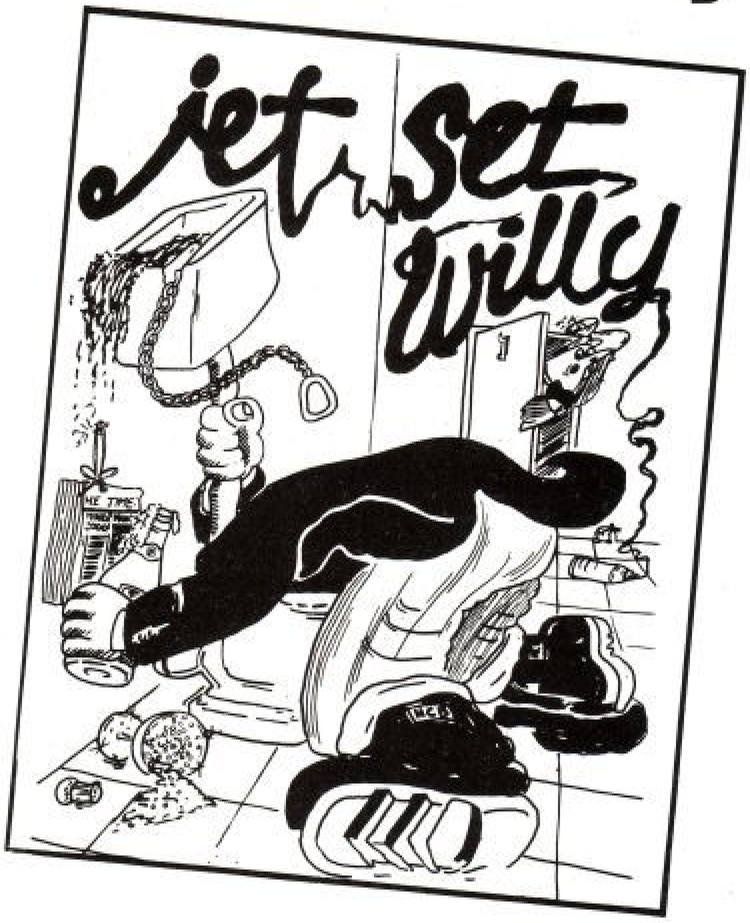


MULTIPLE SPRITE ASSEMBLER LISTING.

```
address  code            assembler         notes
40960    0                                 sprite control byte

control loop
40961    62,1            LD A,1            XOR mode
         205,89,188      CALL &BC59        SCR ACCESS
keyloop  205,27,187      CALL &BB1B        KM READ KEY
         56,5            JR C,5            exit if key down
         205,22,160      CALL 40982        sprite handler
         24,246          JR -10            back to keyloop
         62,0            LD A,0            FORCE mode
         205,89,188      CALL &BC59        SCR ACCESS
         201             RET               back to BASIC
sprite handling loop
40982    6,8             LD B,8
         58,0,160        LD A,(0,160)      get sprite control byte
         79              LD C,A
         62,0            LD A,0
C-check  203,65          BIT 0,C           sprite active?
         40,105          JR Z,105          no - skip to endloop
         50,39,160       LD (40999),A      lo-byte for IX in next line
40997    221,33,0,166    LD IX,42496+0     ↑0 ' is reset by A
         221,110,0       LD L(IX+0)        lo-byte y
         221,102,1       LD H(IX+1)        hi-byte y
         221,94,2        LD E(IX+2)        lo-byte x
         221,86,3        LD D(IX+3)        hi-byte x
         197             PUSH BC           stack registers
         245             PUSH AF           ......
         213             PUSH DE           ......
         229             PUSH HL           ......
         205,146,160     CALL 41106        print sub-routine
         225             POP HL            old y value
         221,94,4        LD E(IX+4)        lo-byte y vector
         221,86,5        LD D(IX+5)        hi-byte y vector
         25              ADD HL,DE
         124             LD A,H            check new hi-byte
         254,255         CP 255            less than 0?
         32,5            JR NZ,5           no - skip to top-y
         33,176,1        LD HL,432         reset y value
         24,12           JR 12             jump to y-store
top-y    254,0           CP 0
         40,8            JR Z,8            o.k. jump to y-store
         125             LD A,L            check lo-byte
         254,176         CP 176            off top?
         56,3            JR C,3            o.k. jump to y-store
         33,0,0          LD HL 0           reset y value
y-store  221,117,0       LD(IX+0),L
         221,116,1       LD(IX+1),H
         235             EX DE,HL          swap to keep HL safe in DE
         225             POP HL            get x value stacked earlier
         221,78,6        LD C(IX+6)
         221,70,7        LD B(IX+7)        x vector in BC
         9               ADD HL,BC
         124             LD A,H            check hi-byte
         254,255         CP 255
         32,5            JR NZ,5           o.k. jump to top-x
         33,192,2        LD HL 704         reset x value
         24,12           JR 12             jump to x-store
top-x    254,2           CP 2
         56,8            JR C,8            o.k. jump to x-store
         125             LD A,L            check lo-byte
         254,192         CP 192
         56,3            JR C,3            o.k. jump to x-store
         33,0,0          LD HL 0           reset x
x-store  221,117,2       LD(IX+2),L
         221,116,3       LD(IX+3),H
         235             EX DE,HL          swap x,y in registers
         205,146,160     CALL 41106        print sub-routine
         241             POP AF
         193             POP BC
endloop  198,12          ADD A,12          adjust for next data block
         203,57          SRL C             shuffle control byte for next
         16,141          DJNZ,-115         back to C-check if B>0
         201             RET               back to control loop
print sub-routine
41106    205,192,187     CALL &BBC0        GRA MOVE ABSOLUTE
         221,126,8       LD A,(IX+8)       top left character
         205,252,187     CALL &BBFC        GRA WR CHAR
         221,126,9       LD A,(IX+9)       top right character
         205,252,187     CALL &BBFC        GRA WR CHAR
         33,240,255      LD HL,240,255     y=-16
         17,192,255      LD DE,192,255     x=-64
         205,195,187     CALL &BBC3        GRA MOVE RELATIVE
         221,126,10      LD A,(IX+10)      bottom left character
         205,252,187     CALL &BBFC        GRA WR CHAR
         221,126,11      LD A,(IX+11)      bottom right character
         205,252,187     CALL &BBFC        GRA WR CHAR
         201             RET               back to handling loop
```

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Rules:

1. The winners will be the first 100 entries drawn on April 30th 1985.
2. There is no limit to the number of entries any individual can make, however all entries must be on an official order form, photocopies are not acceptable. We are sorry that you have to damage your magazine to do this.
3. Entries should be sent to:

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   Jet Set Willy Competition,
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   Brentwood,
   Essex,
   CM14 4EF
4. No correspondence can be entered into regarding the competition. Entries cannot be returned.
5. The judges' decision is final
6. No employees of Software Projects, Amstrad, Amsoft, or their relatives or friends may enter.
7. Every entry must have the number of differences written on the back of the envelope.

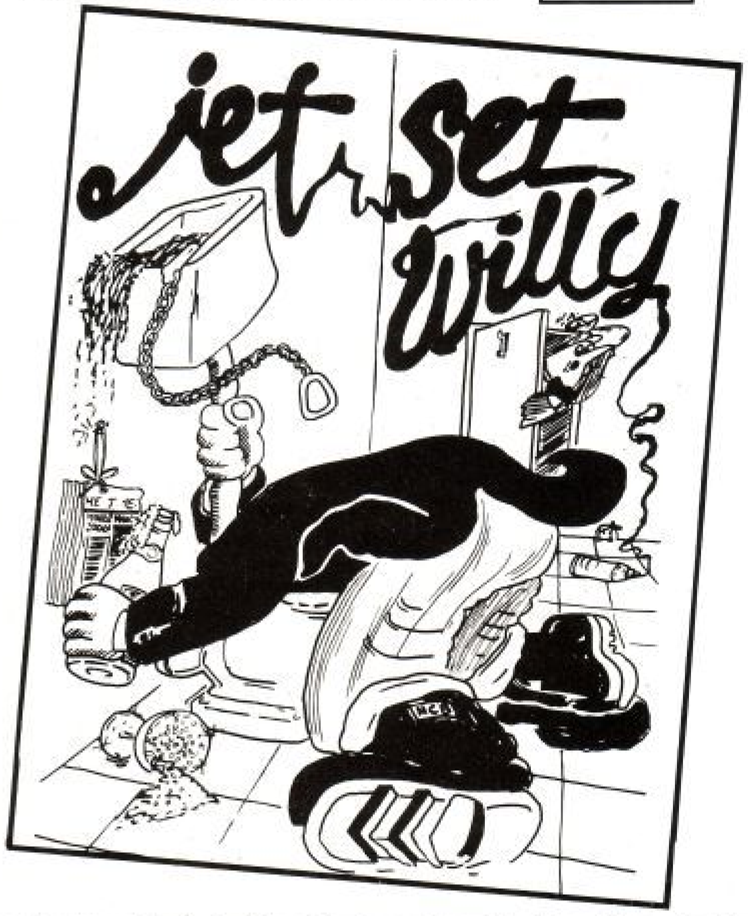
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Address ....

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Number of differences found [ ]



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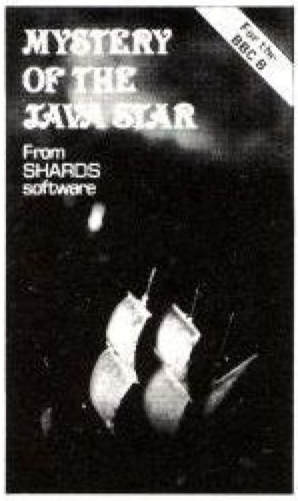
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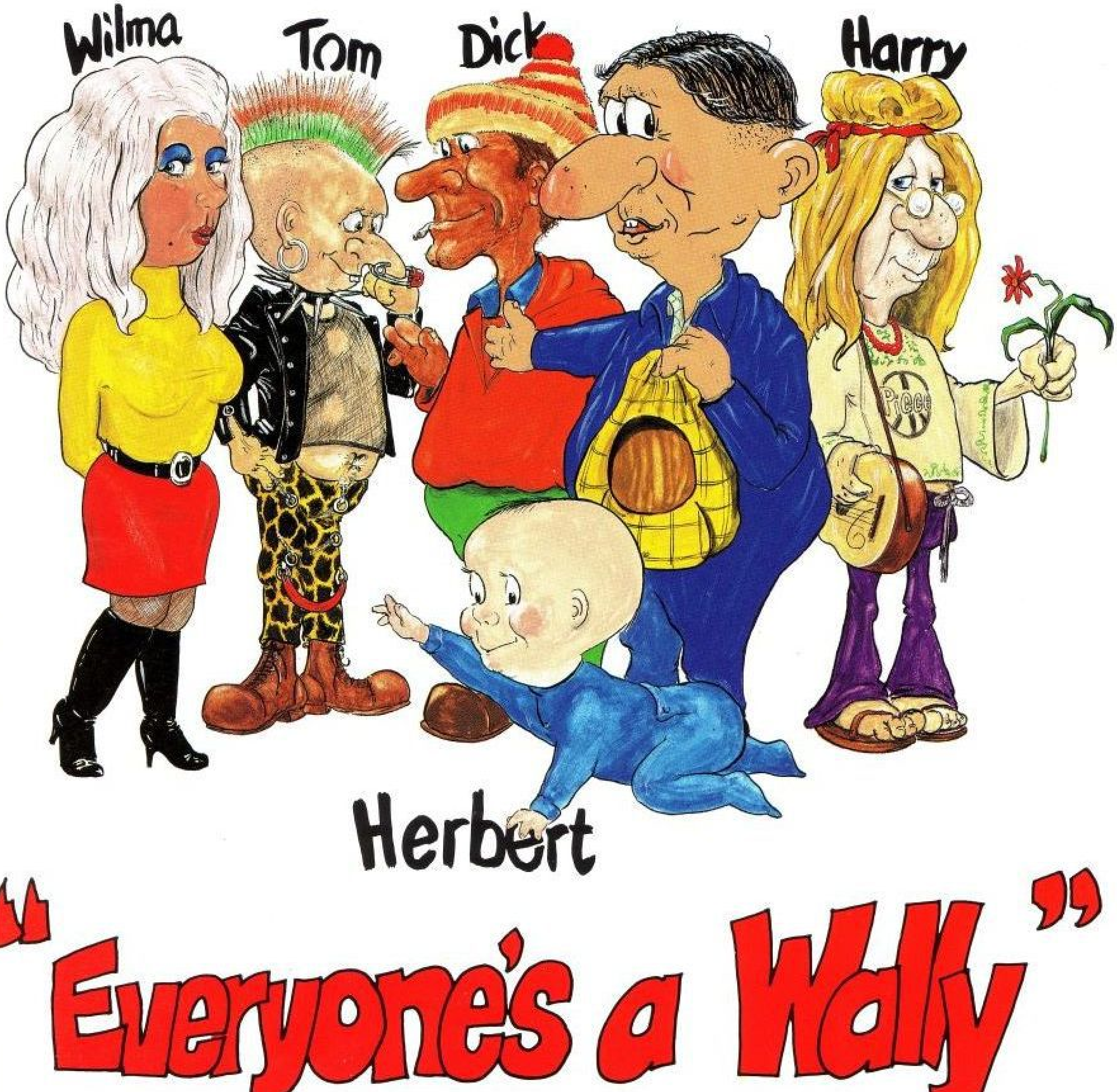
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Speech Synthesizer

The dk'tronics Amstrad speech synthesizer and powerful stereo amplifier uses the popular SLO/256 speech chip and has an almost infinite vocabulary. It is supplied with a text to speech converter for ease of speech output creation. Everything you wish to be spoken is entered in normal English, without special control codes or characters, it is therefore extremely easy to use. The voicing of the words is completely user transparent and the computer can carry on its normal running of a program while the speech chip is talking. The speech output from SLO/256 is mono and directed to both speakers.



Stereo Output

To utilise the Amstrad stereo output on the back of the computer, the interface has a built in stereo amplifier, this gives all sound output a totally new dimension and greatly improves the sound quality and volume over the computer's internal speaker. Any sound that previously came out of the mono speaker will now be sent out via the interface in stereo. All programs that use the sound in anyway (i.e. commercial software) will now output through the interface, which is fitted with volume and balance controls.

Speech Synthesis

The Amstrad speech synthesis utilises parts of the spoken word known as allophones. These are actual sounds that go to make up speech. The SP0256 allophone speech synthesis technique provides the ability to synthesize an almost unlimited vocabulary. Fifty-nine discrete speech sounds (allophones) and five pauses are stored in the speech chip's internal rom.

Text to Speech

Although there are only 26 letters in the alphabet, letters have a totally different sound when used in different words. For example, The "a" in 'Hay' is much longer and softer than in 'Hat'. When you speak you automatically make adjustments because you know just how a word should sound Not quite so easy with a computer.

The machine code software is mainly developed to this mode of operation. 3.5K is used for tables which contain the rules & exceptions to the rules of the English Language.

e.g. I before E except after C) This therefore allows the user to enter words to be spoken in normal English.

Speakers

Supplied with the Speech Synthesizer are two high quality 4" speakers these have been designed to compliment the Amstrad Computer. They are fitted with 1 metre of cable and can be positioned for the best stereo effect. The synthesizer interface fits neatly on to the rear of the computer. It has a through connector to enable other interfaces (e.g. Disc Drive) to connect to the rear of the synthesizer for ease of expansion Please send S.A.E. for a copy of the instruction manual which will give full and comprehensive details.

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There are 8 new Basic Commands which control all the functions of the interface. Making the Synthesizer very easy to use. You can even control the speed at which it will talk to you. Or use the synthesizer to create sound effects like a fourth sound channel.

10 PRINT " 'AMSTRAD' "

The above is an example of the Syntax for entering speech into the computer and shows how simple it is to use.

The instruction book gives comprehensive details and examples of how to use the interface both from machine code and basic.

How to Order

The Amstrad Speech Synthesizer costs only £39.95. You can obtain your synthesizer through any good computer store or by completing the order form and returning it to:
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